Contract No. EP/SP/66/12

Integrated Waste Management Facilities, Phase 1

吉寶西格斯－振華聯營公司
KEPPEL SEGHERS - ZHEN HUA JOINT VENTURE

Supporting Document for reviewing dredging rate and filling rate

(Conditions 2.5, 2.18, 2.23, Table 1 & Figure 5, Further Environmental Permit No. FEP-01/429/2012/A)

Document No.

KSZHJV	/	312	/		/	0001	/	E
Issuer		Project Code		Type of Document		Sequential No.		Revision Index

	Prepared by:	Approved by:	Certified by:	Verified by:
Name	Leo Chow	Kenny Yu	Jacky Leung	Mandy To
Position	Environmental Monitoring Manager (KSZHJV)	Project Manager (KSZHJV)	ETL (Acuity)	IEC (ERM)
Signature				
Date:	10 March 2020	10 March 2020	13 Mar 2020	11 March 2020

Revision History

Rev.	Description of Modification	Date
E	Section 2.1 (Stage 4A), Section 4.3 (Stage 4A), Tables 4.8 – 4.10, 4.19 – 4.21, Appendix B	10 March 2020
D	Refer to the Table of Revision	22 January 2020
C	Revised as per comments received in the meeting with AFCD and EPD on 8 March 2019	12 March 2019
B	Revised as per EPD/s comment issued on 20 December 2018 under letter ref. no. (9) in Ax(1) to EP2/G/G/131 Pt.21	28 January 2019
A	First Issue	6 December 2018

CONTENTS

1	INTRODUCTION	3
1.1	PROJECT BACKGROUND	3
1.2	OBJECTIVES OF THIS DOCUMENT	5
1.3	STRUCTURE OF THIS DOCUMENT	5
2	REVIEW OF DREDGING RATE AND FILLING RATE UNDER UPDATED CONSTRUCTION SEQUENCE	6
2.1	UPDATED CONSTRUCTION SEQUENCE	6
2.2	REASONS TO PROPOSED CHANGE	8
2.3	CORAL MAPPING RESULTS	10
2.4	POST CONSTRUCTION MONITORING SURVEY	12
3	EVALUATION OF ENVIRONMENTAL IMPACTS ASSOCIATED WITH THE PROPOSED CHANGE	14
3.1	AIR QUALITY IMPACT	14
3.2	NOISE IMPACT	14
3.3	WASTE MANAGEMENT IMPLICATIONS	14
3.4	ECOLOGICAL IMPACT	15
3.5	FISHERIES IMPACT	16
3.6	HEALTH IMPACT	16
3.7	LANDSCAPE AND VISUAL IMPACT	16
3.8	IMPACT ON CULTURAL HERITAGE	16
3.9	SUMMARY	16
4	WATER QUALITY IMPACT ASSESSMENT	18
4.1	ASSESSMENT CRITERIA AND NEAREST WATER SENSITIVE RECEIVERS (WSRS)	18
4.2	ASSESSMENT METHODOLOGY	18
4.3	DETERMINATION OF APPROPRIATE WORK RATES AND MITIGATION MEASURES	19

1 INTRODUCTION

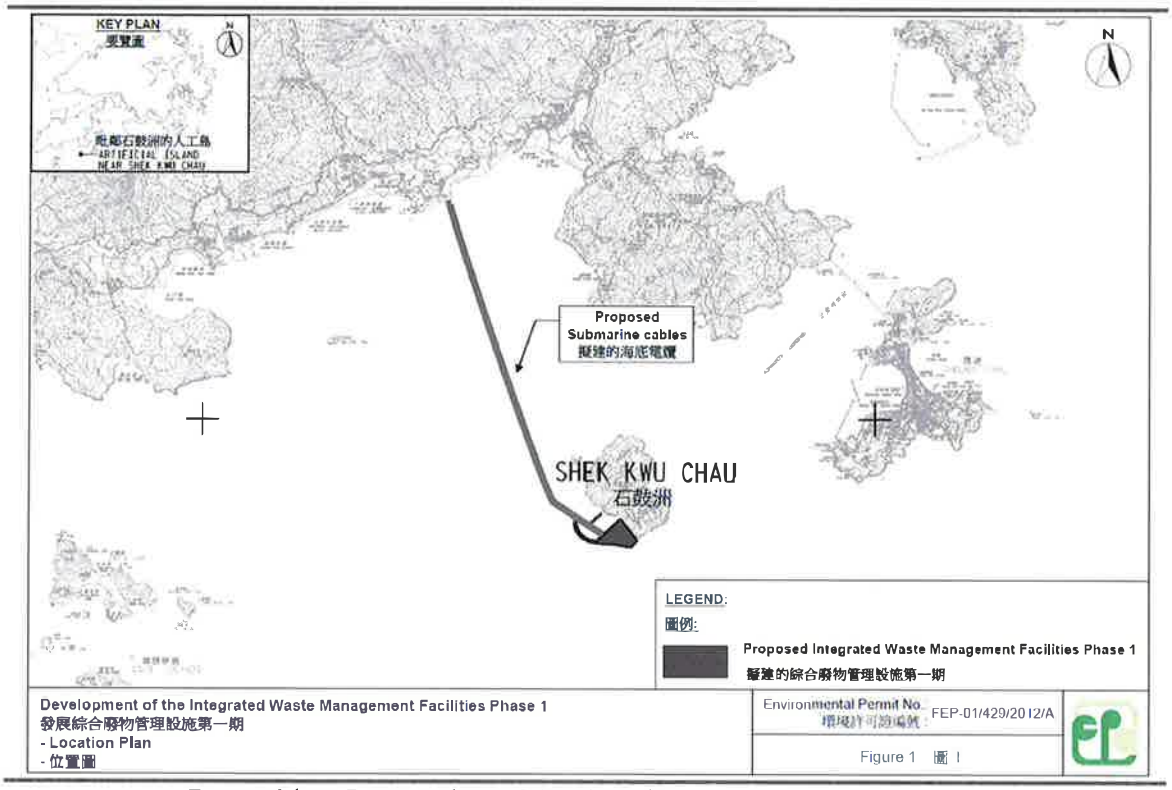
1.1 PROJECT BACKGROUND

Keppel Seghers - Zhen Hua Joint Venture (KSZHJV) was appointed by the Project Team of the Integrated Waste Management Facilities (IWMF) Phase 1 of the Environmental Protection Department (EPD) for the design, construction and operation of IWMF Phase 1 near Shek Kwu Chau under Contract no. EP/SP/66/12 (the Contract).

The Project involves reclamation of land near the south-western coast of Shek Kwu Chau as shown in *Figure 1.1*. Upon the completion of reclamation, the incinerator and associated facilities will be constructed on the reclaimed land. It should be noted that the Contract does not cover the construction of the submarine cables connecting the Project Site and Lantau Island as indicated in *Figure 1.1*.

The construction and operation of the IWMF Phase 1 (hereafter referred to as the Project) is a Designated Project (DP) under Schedule 2 of the *Environmental Impact Assessment (EIA) Ordinance* (Cap. 499). The EIA Report of the Project (EIA-201/2011) was approved on 17 January 2012, and the Environmental Permit (EP) of the Project was issued on 19 January 2012 (EP-429/2012) and a variation of the EP on 14 October 2016 (EP-429/2012/A). A Further Environmental Permit FEP-01/429/2012/A was granted to KSZHJV on 27 December 2017.

Figure 1.1 ***Location in Project Site***



Extracted from Figure 1 of FEP-01/429/2012/A.

The construction of the seawall, reclamation and breakwater will require marine ground treatment works. KSZHJV has re-examined the construction sequence of the seawall, reclamation and breakwater and calculated the water quality impact from different stages of construction activities. The change of construction sequence and its corresponding assessment on water quality impact are described in Section 2 and 3.

According to a recent field trial conducted under Expansion of Hong Kong International Airport into a Three-Runway System Project (1), reduction of sediment dispersion of at least 80% can be achieved using double layers of silt curtain. This reduces the contribution of SS to the nearby WSRs.

With the deployment of two double layers silt curtain in the vicinity of the identified coral located at indirect impact site as an enhanced environmental mitigation measures, KSZHJV shall apply for the change of filling rates as stipulated in Conditions 2.5, 2.18, 2.23, Table 1 and Figure 5 of the Further Environmental Permit FEP-01/429/2012/A.

Due to rough sea condition at Shek Kwu Chau and relatively new marine ground treatment method used in this project, the progress of dredging, DCM works, rock filling to form rubble mound, installation of block work seawall and caisson installation encountered about 2 - 3 months delay.

Hong Kong currently solely relies on landfills to dispose of its municipal solid waste (MSW). As the amount of MSW generated has been increasing considerably in the past decades, the existing landfills are anticipated to reach their capacities in the next few years. To reduce the bulk size of such waste substantially, and to recovery resources as far as possible, the Government's "Hong Kong: Blueprint for Sustainable Use of Resources 2013-2022" proposes that Hong Kong will adopt a variety of new waste-related technologies solution. The IWMF Phase 1 is designed to adopt advanced incineration as the core technology to treat mixed MSW treatment, with a maximum treatment capacity of 3,000 tonnes per day. The timely completion of the IWMF Phase 1 will help in alleviating the waste problem in Hong Kong and benefit the society as a whole. Facing the problem of scarcity of landfill space in Hong Kong, the early start of reclamation is beneficial to our Society as a whole.

Therefore, it was proposed to have a minor amendment of the construction sequence. Reclamation works will commence prior to the complete enclosure of caisson and block work seawall. Temporary double layers silt curtain shall be installed at the eastern side of Artificial Island as a preventive measure. This temporary arrangement will last for about 2 – 3 months. The construction sequence will back to original EP requirement after substantial completion of seawall.

(1) Available at http://env.threerunwaysystem.com/ep%20submissions/201804%20SCDP/5th%20Updated%20SCDP_files/Pilot%20Test%20Report.pdf

1.2 OBJECTIVES OF THIS DOCUMENT

The objectives of this *Supporting Document to revise dredging and filling rate* are:

1. To describe the overall construction sequence and change to the minor amendment of construction sequence for the marine ground treatment works and reclamation works;

2. To identify various scenarios which may have environmental impact;

3. To evaluate the potential environmental impact associated with the identified scenarios, recommend appropriate work rates and additional mitigation measures (if necessary);

4. To review the dredging and filling rate as stipulated in Conditions 2.5, 2.18, 2.23, Table 1 and Figure 5 of the Further Environmental Permit FEP – 01/429/2012/A.

1.3 STRUCTURE OF THIS DOCUMENT

The structure of the remaining document is:

Section 2: ***Review of Dredging Rate and Filling Rate Under Updated Construction Sequence***

This section reviews the maximum dredging rate and filling rate after the implementation of updated construction sequence. As the key environmental impact associated with the proposed change is water quality, it further elaborates on the worst case scenario in terms of potential water quality impact for detailed evaluation in *Section 4*.

Section 3: ***Evaluation of Potential Environmental Impact associated with the Proposed Change***

This section evaluates the potential environmental impacts associated with the proposed changes was evaluated. Water quality is identified as the key environmental impact of the proposed change, the assessment was presented in a separate section (*Section 4*).

Section 4: ***Water Quality Impact Assessment***

This section provides a detailed evaluation of the potential water quality impact associated with the proposed change to construction sequence. The approach adopted in the approved EIA Report was used in the assessment and the appropriate works rates at various works fronts were determined based on the findings of the assessment. Additional mitigation measures were recommended, if required.

2 *REVIEW OF DREDGING RATE AND FILLING RATE UNDER UPDATED CONSTRUCTION SEQUENCE*

This section outlines the construction sequences for reclamation described the latest construction sequence. In addition, the maximum dredging rate and filling rate shall be submitted to Director of Environmental Protection for approval after implementing the enhanced environmental mitigation measures such as installation of two double layers silt curtain in the vicinity of coral colonies in the indirect impact site.

2.1 *UPDATED CONSTRUCTION SEQUENCE*

Construction sequence for ground treatment and hence seawall structures, reclamation filling and breakwaters will be further divided into 5 stages with Stage 4A is a newly added Stage to replace original Stage 4.

- *Stage 1 - Ground Treatment at Seawall Area Only*

  Localised dredging, as shown in Table 2.1, and rock filling operations will be carried out at the northeast seawall, and geotextile and sand blanket, at a maximum rate as shown in Table 2.2, will be laid at the remaining seawall area requiring DCM. The perimeter seawall area is defined as Area A (see *Figure 1* in *Annex A*).

- *Stage 2 - Ground Treatment at Seawall and Reclamation Area*

  Localised dredging and rock filling operations will be continuously carried out at the northeast seawall; and DCM and rock filling operations will be carried out at the remaining seawall of Area A. Geotextile and sand blanket will be laid within reclamation area as Area B after completion of those in Area A (see *Figure 2* in *Annex A*).

- *Stage 3 - Seawall Construction, Ground Treatment at Reclamation Area and Breakwater*

  Localised dredging and rock filling operations will be carried out at the northeast seawall or at the northern breakwater; precast seawall structure will be installed at the northeast seawall; DCM operation will be continuously carried out at the remaining seawall of Area A; ground treatment by PVD will be installed within Area B; geotextile and sand blanket will be laid at the remaining breakwater location after completion of those within the reclamation area (see *Figure 3* in *Annex A*).

- *Stage 4A - Reclamation Filling, Installation of precast seawall, Installation of block work seawall and Ground Treatment at Breakwater*

  After substantial completion of seawall (except approximately 50m

opening and approximately 200m silt curtain located at the eastern side of artificial island), marine filling will be carried out within Area B (reclamation area) and precast seawall structure and block work seawall will be continuously installed at Area A (Vertical Seawall and Seawall A and Seawall B). Ground Treatment such as DCM operation and laying of Grade 200 rock to form rock mound will be carried out in Area B (Breakwater A and B) in parallel (see *Figure 4A* in *Annex A*).

Marine filling works within reclamation area will only be commenced when the installation of block work seawall near the shoreline have been completed for 310m. In other words, the installation of block work seawall between Vertical Seawall Chainage S_CH0 and Vertical Seawall Chainage S_CH310 shall be completed. In addition, the precast caissons at Seawall A between Chainage SB_CH250 and SB_CH580 and at Seawall B between Chainage Q_CH0 and Q_CH388 shall be completed. The locations of the Vertical Seawall Chainage and Seawall A and Seawall B in Area A are shown in *Figure 7*.

- *Stage 5 - Reclamation Filling and Breakwater Construction*

  After substantial completion of seawall (except approximately 50m opening), marine filling will be carried out within reclamation area; and precast seawall structure will be installed at breakwater in parallel (see *Figure 5* in *Annex A*).

Table 2.1 ***Comparison of Calculated Suspended Sediment Elevation under Mitigated Dredging Scenario in the Approved EIA and the VEP Supporting Document***

Distance from the Nearest Coral (m)	Maximum Allowable Production Rate (m^3/day)	Sediment Loss (kg/s)	Maximum SS Elevation at Coral (mg/L)
Dredging Assumed in Approved EIA Report			
Above 100	380	0.04398	2.5
Possible Localised Dredging under the Design proposed by KSZHJV			
16 - 50	60	0.00694	2.5
50 – 100	190	0.02199	2.5

Extracted from Table 2.2 of *VEP Supporting Document*.

Table 2.2 ***Composition of Filling Materials and Filling Rates at Different Locations (for filling below +2.5mPD) in FEP-01/429/2012/A***

Area	Area Code	Maximum Filling Rate (m^3/day)	
		Public Fill	Sand
Filling of reclamation area between 250m and 400m away from the nearest coral community (or between 50m and 200m away from opening for marine access)	A	300	4,000
Filling of reclamation area more than 400m away from the nearest coral community (or more than 200m away from opening for marine access)	B	1,000	3,300

Extracted from Table 1 of FEP-01/429/2012/A.

In order to increase the flexibility of the construction programme, it is recommended to provide the maximum dredging rate when only dredging work shall be conducted.

To reduce the burden of public fill, it is also recommended to use public fill as filling materials below +2.5mPD. Unless the unavailability supplies of public fill from Fill Banks at TKO Area 137 and TM Area 38, it is proposed to use public fill below +2.5mPD for reclamation purpose.

Therefore, the maximum filling rate of different scenarios shall be proposed to Director of Environmental Protection and seek for their approval. Different scenarios shall be described in details in Section 4.

2.2 *REASONS TO PROPOSED CHANGE*

EIA report of the captioned project was conducted more than 10 years ago. In the last 10 years, several severe typhoon had directly hit Hong Kong and may cause some coral colonies recorded in the EIA report not updated. Therefore, coral mapping along the shoreline of Shek Kwu Chau was conducted in January 2019 so as to ensure collect the latest information of the coral colonies along the shoreline of Shek Kwu Chau. The locations and species of coral colonies found during the mapping in January 2019 were presented in *Section* 2.3. In addition, the size of coral colonies, the percentage of mortality, bleaching and sediment shall be mentioned in the coral mapping report and such report shall be submitted to EPD and AFCD for record and the mapping information in January 2019 shall be served as baseline. One post-construction survey on the mapped coral colonies was also proposed to ensure the dredging and filling works shall not affect the mapped coral colonies.

In addition, more boreholes information was collected from site investigation works since the commencement of the Contracts. The extent of the dredging can be finalized based on the updated information.

With due consideration of the latest coral mapping results and the finalized design of block work seawall, there are room for revising dredging rate and filling rate after installation of two double layers silt curtain at the indirect impact site.

The proposed changes can reflect the maximum allowable dredging rate and filling rate after installation of two double layers silt curtain in the vicinity of coral colonies at the indirect impact site.

As dredging activities and filling activities could both contribute the raise of suspended solids in the nearby Water Sensitive Receivers, the original dredging rate and filling rate as stipulated in the Further Environmental Permit No.: FEP – 01/429/2012/A assumed that the dredging work and filling works to be conducted concurrently. It will allow more programme flexibilities when considering the construction activities to be conducted separately as another scenario.

It is also noted that public fill shall predominant be used for filling materials at below +2.5mPD unless the supplies of public fills from Fill Banks at TKO Area 137 and TM Area 38 are unavailable. To get the best compaction effect afterwards, sand fill and public fill shall not be conducted simultaneously. It is therefore required to have a table showing the maximum allowable filling rate for public fill and sand fill separately as the original maximum filling rate as shown in Table 1 of FEP-01/429/2012/A assumed that filling of sand fill and public fill conducted at the same time.

Due to rough sea condition at Shek Kwu Chau and relatively new marine ground treatment method used in this project, the progress of dredging, DCM works, rock filling to form rubble mound, installation of block work seawall and caisson installation encountered about 2 - 3 months delay.

Hong Kong currently solely relies on landfills to dispose of its municipal solid waste (MSW). As the amount of MSW generated has been increasing considerably in the past decades, the existing landfills are anticipated to reach their capacities in the next few years. To reduce the bulk size of such waste substantially, and to recovery resources as far as possible, the Government's "Hong Kong: Blueprint for Sustainable Use of Resources 2013-2022" proposes that Hong Kong will adopt a variety of new waste-related technologies solution. The IWMF Phase 1 is designed to adopt advanced incineration as the core technology to treat mixed MSW treatment, with a maximum treatment capacity of 3,000 tonnes per day. The timely completion of the IWMF Phase 1 will help in alleviating the waste problem in Hong Kong and benefit the society as a whole. Facing the problem of scarcity of landfill space in Hong Kong, the early start of reclamation is beneficial to our Society as a whole.

Therefore, it is proposed that reclamation works will be commenced prior to the completion of installation of caisson and block work seawall. Temporary double layers silt curtain shall be installed at the eastern side of Shek Kwu Chau as a preventive measure to the nearby coral colonies. This temporary arrangement will only last for about 2 – 3 months. The construction sequence will back to original EP requirement after substantial completion of seawall.

With the implementation of the temporary arrangement, the filling rate of public fill and sand fill will be reduced in order to ensure no adverse impact to the water quality nearby.

For stage 4A and 5, opening of marine access at the Western Side of the artificial island has already relocated further away from the location of coral colonies and approved in the previously approved Supporting Document to minimize the impact on them due to dredging and filling activities. For stage 4A, the newly proposed double layers silt curtain located at the eastern side of artificial island is fixed between the installed caissons at the seawall area prior to the complete installation of caisson.

It should be noted that there is no new type of construction activities and the marine filling for reclamation area would still be conducted within the substantially completed seawall in general.

2.3 *CORAL MAPPING RESULTS*

Coral mapping along the shoreline of Shek Kwu Chau was conducted in January 2019. A total of 52 nos. of coral colonies were mapped in the survey and tabulated in *Table* 2.3 and *Table* 2.4. The status of all mapped coral colonies were defined as either Abundant or common in Hong Kong. The location of coral colonies as stated in Table 2.4 were rounded off from the GPS coordinates as recorded by the diver during coral mapping in January 2019.

Table 2.3 Summary Table of Coral colonies mapped in January 2019

Scientific name	No. of individuals	Status in Hong Kong
Coral		
Psammocora superficialis	36	Abundant
Goniopora stutchburyi	16	Common
2 species	52 individuals	

Table 2.4 Location and Species of Coral Colonies mapped in January 2019

Coral No.	Coral Species	Coordinates*	
		Easting	Northing
01	*Psammocora superficialis*	816351	806029
02	*Psammocora superficialis*	816355	806024
03	*Psammocora superficialis*	816446	805966
04	*Psammocora superficialis*	816443	805960
05	*Psammocora superficialis*	816449	805955
06	*Goniopora stutchburyi*	816455	805948
07	*Goniopora stutchburyi*	816462	805941
08	*Psammocora superficialis*	816462	805934
09	*Psammocora superficialis*	816469	805930
10	*Psammocora superficialis*	816475	805927
11	*Goniopora stutchburyi*	816551	805888
12	*Psammocora superficialis*	816556	805888

Coral No.	Coral Species	Coordinates*	
		Easting	Northing
13	*Psammocora superficialis*	816582	805883
14	*Psammocora superficialis*	816588	805884
15	*Goniopora stutchburyi*	816594	805886
16	*Goniopora stutchburyi*	816592	805880
17	*Psammocora superficialis*	816733	805828
18	*Psammocora superficialis*	816739	805826
19	*Psammocora superficialis*	816738	805820
20	*Goniopora stutchburyi*	816741	805815
21	*Psammocora superficialis*	816744	805808
22	*Psammocora superficialis*	816748	805803
23	*Psammocora superficialis*	816770	805754
24	*Goniopora stutchburyi*	816778	805752
25	*Psammocora superficialis*	816782	805745
26	*Psammocora superficialis*	816788	805740
27	*Psammocora superficialis*	816831	805697
28	*Psammocora superficialis*	816835	805694
29	*Goniopora stutchburyi*	816839	805687
30	*Goniopora stutchburyi*	816849	805671
31	*Psammocora superficialis*	816872	805652
32	*Psammocora superficialis*	816855	805664
33	*Goniopora stutchburyi*	816884	805652
34	*Psammocora superficialis*	816890	805638
35	*Goniopora stutchburyi*	816893	805633
36	*Psammocora superficialis*	816890	805620

Coral No.	Coral Species	Coordinates*	
		Easting	Northing
37	*Psammocora superficialis*	816894	805618
38	*Psammocora superficialis*	816895	805613
39	*Psammocora superficialis*	816913	805595
40	*Psammocora superficialis*	816927	805575
41	*Goniopora stutchburyi*	816930	805572
42	*Goniopora stutchburyi*	816943	805558
43	*Psammocora superficialis*	816957	805553
44	*Psammocora superficialis*	816968	805548
45	*Psammocora superficialis*	816992	805543
46	*Psammocora superficialis*	816996	805543
47	*Goniopora stutchburyi*	817002	805541
48	*Psammocora superficialis*	817057	805564
49	*Psammocora superficialis*	817062	805567
50	*Psammocora superficialis*	817056	805557
51	*Goniopora stutchburyi*	817060	805560
52	*Goniopora stutchburyi*	817065	805562

Note:

* - The coordinates of coral colonies were rounded off from GPS coordinates as recorded by diver during coral mapping in January 2019 and shall be indicative only.

2.4 *POST CONSTRUCTION MONITORING SURVEY*

After the construction of eco-shoreline and all marine works, one post construction monitoring survey shall be carried out to check the conditions of all mapped coral colonies as recorded in coral mapping in January 2019.

The coral mapping area in the post construction monitoring survey shall be the same as those mapping areas in January 2019. The parameters to be monitored for coral colonies in the post construction monitoring survey shall

be the same the parameters to be monitored for coral colonies in indirect impact site and control site. The parameters to be monitored are tabulated in *Table 2.5*.

Table 2.5 Parameters of coral colonies shall be monitored in post construction monitoring survey

Coral #	Species	Size (cm) – Max. Diameter/ Height	Mortality (%)		Bleaching (%)		Sediment (%)	
			Baseline	Completion	Baseline	Completion	Baseline	Completion

A post construction monitoring survey report shall be submitted to EPD and AFCD for the record.

3 EVALUATION OF ENVIRONMENTAL IMPACTS ASSOCIATED WITH THE PROPOSED CHANGE

The environmental impacts (with respect to the environmental aspects assessed in the approved EIA Report) associated with the proposed change in construction sequence are evaluated in this section. The key environmental impact associated with the proposed change will be water quality and the detailed assessment is present in *Section 4*.

3.1 AIR QUALITY IMPACT

As discussed in *Section 2.2*, there is no new type of marine construction activities and the proposed change to the minor amendment of construction sequence will not increase the number of construction plant and the overall duration for the construction of the marine works. The associated air quality impact associated with the operation of the marine construction plant is anticipated to be reduced as compared with those predicted in the approved EIA Report and *VEP Supporting Document*.

Hence, no adverse air quality impact due to the proposed change is anticipated.

3.2 NOISE IMPACT

As discussed in *Section 2.2*, there is no new type of marine construction activities and the proposed change to the minor amendment of construction sequence will not increase the number of construction plant and the overall duration for the construction of the marine works. The overall sound power level generated from the operating plants is anticipated to be similar as compared with those predicted in the approved EIA report and VEP supporting document.

Hence, no adverse noise impact due to the proposed change is anticipated.

3.3 WASTE MANAGEMENT IMPLICATIONS

As discussed in *Section 2.2*, there is no new type of marine construction activities and the proposed change to the minor amendment of construction sequence will not increase the number of construction plant and the overall duration for the construction of the marine works. The quantity of waste to be generated from the work force and maintenance of the marine construction plant during the construction of the reclamation is anticipated to be similar as compared with those predicted in the approved EIA Report and VEP Supporting Document.

Hence, no adverse waste impact due to the proposed change is anticipated.

3.4 *ECOLOGICAL IMPACT*

As discussed in *Section 2.2*, there is no new type of marine construction activities and the proposed change to the construction sequence will not increase the number of construction plant and the overall duration for the construction of the marine works. The indirect impacts from air emission, construction noise and general disturbance on terrestrial ecological resources, namely White-bellied Sea Eagle (*Haliaeetus leucogaster*) nested on the Shek Kwu Chau Island are anticipated to be similar as comparing with that predicted in the VEP Supporting Document.

It should be noted that most of the corals that may be impacted by the Project have been translocated. Potential water quality impact associated with the proposed change to construction sequence on the nearest non-translocatable coral has been assessed in *Section 4*. With the implementation of applicable mitigation measures stated in the approved EIA and VEP Supporting Document as well as additional mitigation measures (additional layer of silt curtain at sand blanket laying area and double layer of silt curtain between sediment sources and non-translocatable coral and installation of fixed double layers of silt curtain at the eastern side of Shek Kwu Chau), no unacceptable water quality impact (due to elevation of suspended solids) on the non-translocatable coral is predicted due to the marine works.

The proposed change to the minor amendment of construction sequence will not increase the overall number of construction plant to be used at any one time. Hence, the proposed change will have similar impact to the marine mammal comparing with that predicted in the VEP Supporting Document.

As the proposed change to minor amendment of construction sequence will not change the footprint of the reclamation and breakwater, it is anticipated that the potential impact on benthic organisms will be the same as that predicted in the VEP Supporting Document and hence no adverse impact is anticipated.

Overall, the potential impact on terrestrial and marine ecological resources due to the proposed change is expected to be limited and the level would not be worse than that predicted in the VEP Supporting Document. The existing mitigation measures required under the approved EIA, including avoidance of works in peak seasons, using quieter construction methods and plant, implementation of marine mammal exclusion zones and watching plan, etc. are considered appropriate and sufficient, and no additional mitigation measure for ecology is required.

3.5 *Fisheries Impact*

As discussed in *Section 4*, the water quality impact associated with the proposed change to construction sequence is expected to be no worse than of that predicted in the VEP Supporting Document.

As the proposed change to minor amendment of construction sequence will not change the footprint of the reclamation and breakwater, there will be no change to the loss of fishing ground as that predicted in the VEP Supporting Document.

Therefore, the proposed change will not cause adverse fisheries impact. No additional mitigation measure for fisheries is required.

3.6 *Health Impact*

The proposed change to minor amendment of construction sequence will not affect the findings and recommendations of operation phase health impact assessment predicted in the approved EIA Report and VEP Supporting Document.

3.7 *Landscape and Visual Impact*

The nature and location of the marine construction activities will not change due to the proposed change to minor amendment of construction sequence. The proposed change will not increase the overall number of construction plant to be used at any one time. The proposed change will not affect any landscape resources at the south-west of Shek Kwu Chau. It is therefore not anticipated to have any significant change to the findings and recommendations of the landscape and visual impact assessments of the approved EIA Report and VEP Supporting Document.

No unacceptable landscape and visual impact will be expected and no additional mitigation measure is required.

3.8 *Impact on Cultural Heritage*

The proposed change will not affect reclamation footprint. Therefore, it is expected that there will be no change to the potential impact on underwater cultural resources and no additional mitigation measure is required.

3.9 *Summary*

The potential environmental impacts (air, noise, waste, marine ecology, fisheries, health impact, and landscape and visual) due to the proposed change to minor amendment of construction sequence have been reviewed.

It is concluded that with the implementation of the mitigation measures

recommended in the approved EIA and VEP Supporting Document and the additional mitigation measures for water quality (see *Section 4*), no adverse environmental impact is anticipated and the impacts will not be worse than those predicted in the approved EIA Report and VEP Supporting Document.

The water quality impact assessment is discussed in *Section 4*.

4 WATER QUALITY IMPACT ASSESSMENT

Elevation of suspended solids (SS) from marine works including dredging, sand blanket laying and marine filling are considered as the major water quality issue under this Project. Marine filling within reclamation area has been evaluated in the approved EIA Report and the VEP Supporting Document. The potential water quality impact arising from concurrent activities of marine ground treatment works including DCM operation, dredging and sand blanket laying, will be of major concern.

As discussed in the VEP Supporting Document, no water quality impact would be expected from the DCM operation as shown by a number of overseas studies and the recent field DCM trial conducted by the Airport Authority Hong Kong. Therefore, the potential water quality impact associated with the DCM operation will not be considered in this assessment.

Other marine works, such as rock filling, installation of pre-cast seawall and installation of PVD, are not expected to result in notable release of SS into the water column, and are therefore not included in this assessment.

4.1 ASSESSMENT CRITERIA AND NEAREST WATER SENSITIVE RECEIVERS (WSRS)

The assessment criterion of 2.5 mg/L SS elevation would be adopted. This criterion was established based on the 30% tolerance value of 90th-percentile SS level for EPD Marine Water Quality Monitoring Station SM13 in wet season of 2007-2010. This is the same assessment criterion adopted in the approved EIA Report as well as the VEP Supporting Document.

There were a number of coral colonies identified in the approved EIA Report and they were the nearest WSRs to the Project site. Translocation of the coral to be impacted by the Project was recommended in the approved EIA Report and was conducted in March 2018. Several groups of non-translocatable coral colonies within indirect impact site (shown as blue spots in *Figure 6A, 6B and 6C* of *Annex A*) are considered as the critical WSR for this assessment.

4.2 ASSESSMENT METHODOLOGY

The same near field sediment dispersion modelling adopted in the approved EIA Report as well as the VEP Supporting Document was used. Predicted SS elevation at the WSR was estimated by the following formulae:

$$C(x) = \frac{q}{(D \times x \times \omega \times \sqrt{\pi})}$$

where C(x) = concentration of SS at distance x from the source;

q = sediment loss rate (kg/s);

D = water depth (m);

x = distance from source (m);

ω = diffusion velocity (m/s).

Applicable values in the approved EIA Report were adopted in this assessment, namely water depth D = 10 m and diffusion velocity ω = 0.01 m/s.

4.3 *Determination of Appropriate Work Rates and Mitigation Measures*

Appropriate works rates for the proposed filling and dredging works as well as mitigation measures were determined for each major stage of marine works based on plant arrangement, and assessment method and criterion described in *Sections 4.1* and *4.2*.

Water Quality Mitigation Measures to be considered

In view of the short distance from the nearest coral sites, a number of mitigation measures have been recommended in the approved EIA Report or VEP Supporting Document to minimise the potential water quality impact from the marine construction works. These measures are listed in *Table 4.1* and are taken into considerations in the assessment. Furthermore, additional mitigation measures have been considered and taken into account in the assessment and are also included in *Table 4.1* below.

Table 4.1 ***Consideration of Relevant Water Quality Mitigation Measures***

Mitigation Measures for the Current Ground Treatment and Reclamation Proposal	Existing Measures Recommended in the EIA / EP / VEP?	Effect	Reference
No dredging shall be carried out within 16m to the nearest non-translocatable coral colony/ colonies. For area between 16m and 50m away from the nearest non-translocatable coral community, the maximum daily dredging rate shall not exceed 60 m^3; for area between 50m and 100m away from the nearest non-translocatable coral community, the maximum daily dredging rate shall not exceed 190 m^3; and for area more than 100m away from the nearest non-translocatable coral community, the maximum daily dredging rate shall not exceed 380 m^3.	Yes	The combined effect of limited dredging rate and the use of frame-type silt curtain will limit the maximum SS elevation from the dredging operation to be at or below 2.5 mg/L, which is the assessment criterion adopted in the approved EIA Report and *VEP Supporting Document*.	• EP Conditions 2.18-2.20 • Approved EIA Section 5b.7.3.26-29 • *VEP Supporting Document* Section 2.2.3.12-15.

Mitigation Measures for the Current Ground Treatment and Reclamation Proposal	Existing Measures Recommended in the EIA / EP / VEP?	Effect	Reference
Each grab shall be enclosed by a frame-type silt curtain.			
Translocation of coral colonies which are very close to the Project site / directly impacted	Yes	• The non-translocated coral colonies are further away from the Project site and would be less impacted by the potential change in water quality from marine construction. • The remaining coral colonies which are not translocated are shown in *Figures 6A* as blue patch.	• EP Conditions 2.12 • Approved EIA Section 5b.8.1.9.
The sand blanket laying work will be undertaken using the controlled method such as grab dredger or bottom placement method by trailer suction hopper dredger, sand spreading pontoon or sprinkler barges, etc.) to discharge the sand material near the seabed. In addition, silt curtains will be deployed to enclose the sand blanket laying area (1).	Existing measurement plus additional measure (two double layers of silt curtain)	Both measures minimise the potential loss of fine and disturbance to seabed, thus reducing water quality impact.	*VEP Supporting Document* Section 3.2.2.5-7.
Two double layers of silt curtain will be installed in between Project site and the nearby coral colonies	No; Proposed as an additional measure	According to a recent field trial conducted under Expansion of Hong Kong International Airport into a Three-Runway System Project (2), reduction of sediment dispersion of at least 80% can be achieved using one double layers of silt curtain. This reduces the contribution of SS to the nearby WSRs. According to the EIA report from Tuen Mun –	Pilot test report under Expansion of Hong Kong International Airport into a Three-Runway System Project EIA report of Tuen Mun – Chek

(1) It is proposed in the *VEP Supporting Document* that silt curtains would be adopted around sand blanket laying work. It is proposed to adopt double layers of silt curtain instead of single layer for better silt control.

(2) Available at http://env.threerunwaysystem.com/ep%20submissions/201804%20SCDP/5th%20Updated%20SCDP_files/Pilot%20Test%20Report.pdf

Mitigation Measures for the Current Ground Treatment and Reclamation Proposal	Existing Measures Recommended in the EIA / EP / VEP?	Effect	Reference
		Chek Lap Kwok Link, the combined reduction of fine content of the filling materials when deploying different types of silt curtain concurrently can be assumed by multiplying both loss reduction factor of individual type of silt curtain system.	Lap Kwok Link
Finish the part of seawall close to coral colonies first to allow the seawall structure to protect coral from suspended solids	No; Proposed as an additional measure	While it may not fully qualified as leading seawall, the seawall structure is known to be effective in controlling sediment dispersion. The effect of seawall is not taken into account in the assessment calculation for this Study though.	Approved EIAs of Expansion of Hong Kong International Airport into a Three-Runway System and Hong Kong Boundary Crossing Facilities
Conduct sand blanket laying at far corner from the nearest coral first while localized dredging proceed close to the nearest coral	No; Proposed as an additional measure	The proposed arrangement would avoid concurrent works close to the nearest coral. This means the actual work arrangement would not reach the worst cases assessed in the subsequent sections.	-
For stage 4A, install a double layers silt curtain at the eastern side of the artificial island.	No; Proposed as an additional measure	The constructed seawall together with the newly installed double layers silt curtain at the eastern side of artificial island can effectively controlled the dispersion of sediment.	
For Stage 4A and 5, install Type 6 silt curtain as per approved Silt Curtain Deployment Plan during infilling of Grade 200 and Grade 75 rock into caisson	Yes; Approved Silt Curtain Deployment Plan	The proposed arrangement acts as an enhancement measures to control dispersion of plumes during infilling of caisson.	Approved Silt Curtain Deployment Plan

Mitigation Measures for the Current Ground Treatment and Reclamation Proposal	Existing Measures Recommended in the EIA / EP / VEP?	Effect	Reference
Conduct one post construction monitoring survey for the mapped coral colonies	No; Proposed as an additional measure	To record the conditions of the mapped coral colonies after filling and dredging activities and the completion of construction of eco-shoreline	

Sediment loss rate from dredging, sand blanket laying and marine fill by using sand fill and marine fill by using public fill are calculated as follow in *Table 4.2*.

Table 4.2 ***Calculation of Sediment Loss Rate from Construction Activities***

Construction Activities	Working Hour per day	Unit Loss Rate (Unmitigated)	Loss Rate (Unmitigated)	Reference
Dredging				
60 m^3/day (for 16 - 50 m from nearest coral)	12	20 kg/m^3	60 m^3/day ÷ 12 hr/day ÷ 3600 s/hr × 20 kg/m^3 = 0.0278 kg/s	Approved EIA
190 m^3/day (for 50 - 100 m from nearest coral)	12	20 kg/m^3	190 m^3/day ÷ 12 hr/day ÷ 3600 s/hr × 20 kg/m^3 = 0.0880 kg/s	Approved EIA
380 m^3/day (for >100 m from nearest coral)	12	20 kg/m^3	380 m^3/day ÷ 12 hr/day ÷ 3600 s/hr × 20 kg/m^3 = 0.1759 kg/s	Approved EIA
600 m^3/day (for >24 m from nearest coral)	12	20 kg/m^3	600 m^3/day ÷ 12 hr/day ÷ 3600 s/hr × 20 kg/m^3 = 0.2778 kg/s	Approved EIA, with the implementation of additional mitigation measures as approved in the Supporting Document Rev. C
700 m^3/day (for >24 m from nearest coral)	12	20 kg/m^3	700 m^3/day ÷ 12 hr/day ÷ 3600 s/hr × 20 kg/m^3 = 0.3241 kg/s	Approved EIA, with the implementation of additional mitigation measures as approved in the Supporting Document Rev. C
1900 m^3/day (for >24 m from nearest coral)	12	20 kg/m^3	1900 m^3/day ÷ 12 hr/day ÷ 3600 s/hr × 20 kg/m^3 = 0.8796 kg/s	Approved EIA, with the implementation of additional mitigation measures as approved in the Supporting Document Rev. C
Sand Blanket Laying (Sand fill)				
1000 m^3/hr (reference)	12	-	2.551 kg/s	Approved EIA of Expansion of Hong Kong International Airport into a

Construction Activities	Working Hour per day	Unit Loss Rate (Unmitigated)	Loss Rate (Unmitigated)	Reference
				Three-Runway System (AEIAR-185/2014) [1]
850 m^3/hr	12	-	2.551 kg/s × 850 m^3/hr ÷ 1000 m^3/hr = 2.1684 kg/s	Approved EIA of Expansion of Hong Kong International Airport into a Three-Runway System (AEIAR-185/2014) [1]
900 m^3/hr	12	-	2.551 kg/s × 900 m^3/hr ÷ 1000 m^3/hr = 2.2959 kg/s	Approved EIA of Expansion of Hong Kong International Airport into a Three-Runway System (AEIAR-185/2014) [1]
1000 m^3/hr	12	-	2.551 kg/s × 1000 m^3/hr ÷ 1000 m^3/hr = 2.551 kg/s	Approved EIA of Expansion of Hong Kong International Airport into a Three-Runway System (AEIAR-185/2014) [1]
1080 m^3/hr	12	-	2.551 kg/s × 1080 m^3/hr ÷ 1000 m^3/hr = 2.7551 kg/s	Approved EIA of Expansion of Hong Kong International Airport into a Three-Runway System (AEIAR-185/2014) [1]
1250 m^3/hr	12	-	2.551 kg/s × 1250 m^3/hr ÷ 1000 m^3/hr = 3.1888 kg/s	Approved EIA of Expansion of Hong Kong International Airport into a Three-Runway System (AEIAR-185/2014) [1]
1400 m^3/hr	12	-	2.551 kg/s × 1400 m^3/hr ÷ 1000 m^3/hr = 3.5714 kg/s	Approved EIA of Expansion of Hong Kong International Airport into a Three-Runway System (AEIAR-185/2014) [1]
1500 m^3/hr	12	-	2.551 kg/s × 1500 m^3/hr ÷ 1000 m^3/hr = 3.8265 kg/s	Approved EIA of Expansion of Hong Kong International Airport into a Three-Runway System (AEIAR-185/2014) [1]
1730 m^3/hr	12	-	2.551 kg/s × 1730 m^3/hr ÷ 1000 m^3/hr = 4.4132 kg/s	Approved EIA of Expansion of Hong Kong International Airport into a Three-Runway System (AEIAR-185/2014) [1]
2150 m^3/hr	12	-	2.551 kg/s × 2150 m^3/hr ÷ 1000 m^3/hr = 5.4847 kg/s	Approved EIA of Expansion of Hong Kong International Airport into a Three-Runway System (AEIAR-185/2014) [1]
Marine Fill (Sand fill)				
583.56 m^3/hr (reference)	12	-	0.65 kg/s	Approved EIA of Development of Integrated Waste Management Facilities Phase 1 (AEIAR-163/2012)
1425 m^3/hr	12	-	0.65 kg/s × 1425 m^3/hr ÷ 583.56 m^3/hr = 1.5872kg/s	Approved EIA of Development of Integrated Waste Management Facilities Phase 1 (AEIAR-163/2012)
2850 m^3/hr	12	-	0.65 kg/s × 2850 m^3/hr ÷ 583.56 m^3/hr = 3.1745kg/s	Approved EIA of Development of Integrated Waste Management Facilities Phase 1 (AEIAR-163/2012)

Construction Activities	Working Hour per day	Unit Loss Rate (Unmitigated)	Loss Rate (Unmitigated)	Reference
6000 m^3/hr	12	-	0.65 kg/s × 6000 m^3/hr ÷ 583.56 m^3/hr = 6.6831kg/s	Approved EIA of Development of Integrated Waste Management Facilities Phase 1 (AEIAR-163/2012)
9925 m^3/hr	12	-	0.65 kg/s × 9925 m^3/hr ÷ 583.56 m^3/hr = 11.055kg/s	Approved EIA of Development of Integrated Waste Management Facilities Phase 1 (AEIAR-163/2012)
12000 m^3/hr	12	-	0.65 kg/s × 12000 m^3/hr ÷ 583.56 m^3/hr = 13.366kg/s	Approved EIA of Development of Integrated Waste Management Facilities Phase 1 (AEIAR-163/2012)
19850 m^3/hr	12	-	0.65 kg/s × 19850 m^3/hr ÷ 583.56 m^3/hr = 22.11kg/s	Approved EIA of Development of Integrated Waste Management Facilities Phase 1 (AEIAR-163/2012)
Marine Fill (Public fill)				
583.56 m^3/hr (reference)	12	-	3.85 kg/s	Approved EIA of Development of Integrated Waste Management Facilities Phase 1 (AEIAR-163/2012)
240 m^3/hr	12	-	3.85 kg/s × 240 m^3/hr ÷ 583.56 m^3/hr = 1.5834kg/s	Approved EIA of Development of Integrated Waste Management Facilities Phase 1 (AEIAR-163/2012)
485 m^3/hr	12	-	3.85 kg/s × 485 m^3/hr ÷ 583.56 m^3/hr = 3.1998kg/s	Approved EIA of Development of Integrated Waste Management Facilities Phase 1 (AEIAR-163/2012)
1045 m^3/hr	12	-	3.85 kg/s × 1045 m^3/hr ÷ 583.56 m^3/hr = 6.8943kg/s	Approved EIA of Development of Integrated Waste Management Facilities Phase 1 (AEIAR-163/2012)
1675 m^3/hr	12	-	3.85 kg/s × 1675 m^3/hr ÷ 583.56 m^3/hr = 11.051kg/s	Approved EIA of Development of Integrated Waste Management Facilities Phase 1 (AEIAR-163/2012)
2090 m^3/hr	12	-	3.85 kg/s × 2090 m^3/hr ÷ 583.56 m^3/hr = 13.789kg/s	Approved EIA of Development of Integrated Waste Management Facilities Phase 1 (AEIAR-163/2012)
3350 m^3/hr	12	-	3.85 kg/s × 3350 m^3/hr ÷ 583.56 m^3/hr = 22.102kg/s	Approved EIA of Development of Integrated Waste Management Facilities Phase 1 (AEIAR-163/2012)

Note: (1) Quantitative assessment was conducted for sand filling activities but not for sand blanket laying in the approved EIA Report. Quantitative assessment for sand blanket laying was also not conducted in the VEP Supporting Document. Therefore, reference has been made to the Approved EIA Report of Expansion of Hong Kong International Airport into a Three-Runway System (AEIAR-185/2014) for the typical sediment loss rate from sand blanket laying activities.

Calculation Assumption:

1. Silt removal efficiencies of cage type silt curtain = 75%
2. Silt removal efficiencies of one double layers of floating type silt curtain = 80%
3. Silt removal efficiencies of two double layers of floating type silt curtain = (1- 0.2*0.2) * 100% = 96%

The sediment loss rate of Marine Fill (sand fill) in reference source is calculated by adopting the following formula:
3.85kg/s (Sediment loss rate of marine fill (public fill) = $xm^3/s * 1900 kg/m^3 * 25\% * 5\%$
$x = 0.1621m^3/s$
$x = 0.1621 * 3600 = 583.56m^3/hr$

By adopting the same filling method and equipment, the sediment loss rate of marine fill (sand fill) = 0.1621 * 1600 * 5% * 5%
= 0.65 kg/ s

Stage 1

In this stage, the concurrent marine works for the Project include (1) localised dredging and rock filling operation at the northeast seawall, and (2) sand blanket laying within Area A. In this stage of work, the work arrangement is the same as stated in the VEP Supporting Document (with the exception of the proposed two double layers of silt curtain). Nevertheless, an estimation of maximum allowable rate of sand filling is provided below as good practice. Both localised dredging and sand blanket laying could result in release of fines into the water column and subsequently elevation of SS at the WSRs.

Stage 2

In this stage, the concurrent marine works for the Project include (1) localised dredging and rock filling operation at the northeast seawall [1], (2) DCM and rock filling operation at the remaining seawall of Area A, and (3) sand blanket laying within Area B. Among these works, localised dredging and sand blanket laying could result in release of fines into the water column and subsequently elevation of SS at the WSRs.

(1) It should be noted that the localised dredging at the northeast seawall should have been completed before the commencement of this stage and the remaining ground treatment work for the northeast seawall would be rock filling only. For the estimation of maximum allowable rate of sand blanket laying, it is assumed the localized dredging is not completed at this stage for conservative assessment and to accommodate uncertainties in construction programme.

Stage 3

In this stage, the concurrent marine works for the Project include (1) installation of precast seawall structure at the northeast seawall, (2) DCM operation at the remaining seawall of Area A, (3) PVD installation within Area B, localised dredging and rock filling operation at the north breakwater, and (4) sand blanket laying at the remaining breakwater. Among these works, localised dredging and sand blanket laying could results in release of fines into the water column and subsequently elevation of SS at the WSRs.

To represent the worst case scenario in Stage 1, 2 and 3, the calculation of the proposed dredging rate and filling rate were based on the assumption that both dredging and filling work to be carried out in the location nearest to the sensitive receivers. Hence, the nearest distance between coral colonies and dredging area is 24m and the nearest distance between coral colonies and sand blanket laying is 58m.

The proposed work rates for sand blanket laying are 1,000 m^3/hr between 24 m and 250 m away from the nearest coral colonies, 1,730 m^3/hr for sand blanket laying between 250 m and 400 m, and 1,730 m^3/hr for sand blanket laying from 400 m onwards if the dredging volume is kept at 380m^3/day.

If the dredging rate changes to 600m^3/day, the proposed work rates for sand blanket laying are 900 m^3/hr between 24 m and 250 m away from the nearest coral colony, 1,500 m^3/hr for sand blanket laying between 250 m and 400 m, and 1,500 m^3/hr for sand blanket laying from 400 m onwards.

If the dredging rate changes to 700m^3/day, the proposed work rates for sand blanket laying are 850 m^3/hr between 24 m and 250 m away from the nearest coral colony, 1,400 m^3/hr for sand blanket laying between 250 m and 400 m, and 1,400 m^3/hr for sand blanket laying from 400 m onwards.

The corresponding of SS contribution by these two kinds of marine works in Stage 1 to 3 at the nearest WSR is presented in *Tables 4.3 – 4.5*. The maximum work rates for separate construction activities are shown in *Table 4.6 and 4.7*.

Table 4.3 ***Calculation of Cumulative SS Elevation (Dredging Rate at 380m^3/day) – Stage 1, 2, and 3***

Sources	Distance from the Nearest WSR (m)	Work Rate	Sediment Loss Rate - without mitigation at source (kg/s)	Mitigation Measure efficiency at Source	Sediment Loss Rate - with mitigation at source (kg/s)	SS at WSR - without mitigation at WSR (mg/L)	Mitigation Measure at WSR	SS at WSR - with mitigation at WSR (mg/L)
Within 250 m away from nearest WSRs								
Localized dredging at the northeast seawall	24	380 m^3/day	0.1759	75%	0.0440	10.34	96%	0.41

Sources	Distance from the Nearest WSR (m)	Work Rate	Sediment Loss Rate - without mitigation at source (kg/s)	Mitigation Measure efficiency at Source	Sediment Loss Rate - with mitigation at source (kg/s)	SS at WSR - without mitigation at WSR (mg/L)	Mitigation Measure at WSR	SS at WSR - with mitigation at WSR (mg/L)
Sand blanket laying within Area A / B (Sand fill)	58	1,000 m^3/hr	2.551	80%	0.5102	49.63	96%	1.99
							Total	**2.40**
Beyond 250 m away from nearest WSRs								
Localized dredging at the northeast seawall	24	380 m^3/day	0.1759	75%	0.0440	10.34	96%	0.41
Sand blanket laying within Area A / B (Sand fill)	250	1,730 m^3/hr	4.4132	80%	0.8826	19.92	96%	0.80
							Total	**1.21**
Beyond 400 m away from nearest WSRs								
Localized dredging at the northeast seawall	24	380 m^3/day	0.1759	75%	0.0440	10.34	96%	0.41
Sand blanket laying within Area A / B (Sand fill)	400	1,730 m^3/hr	4.4132	80%	0.8826	12.45	96%	0.50
							Total	**0.91**

Table 4.4 Calculation of Cumulative SS Elevation (Dredging Rate at 600m^3/day) – Stage 1, 2 and 3

Sources	Distance from the Nearest WSR (m)	Work Rate	Sediment Loss Rate - without mitigation at source (kg/s)	Mitigation Measure efficiency at Source	Sediment Loss Rate - with mitigation at source (kg/s)	SS at WSR - without mitigation at WSR (mg/L)	Mitigation Measure at WSR	SS at WSR - with mitigation at WSR (mg/L)
Within 250 m away from nearest WSRs								
Localized dredging at the northeast seawall	24	600 m^3/day	0.2778	75%	0.0695	16.34	96%	0.65
Sand blanket laying within Area A / B (Sand fill)	58	900 m^3/hr	2.2959	80%	0.4592	44.67	96%	1.79
							Total	**2.44**
Beyond 250 m away from nearest WSRs								
Localized dredging at the northeast seawall	24	600 m^3/day	0.2778	75%	0.0695	16.34	96%	0.65

Sources	Distance from the Nearest WSR (m)	Work Rate	Sediment Loss Rate - without mitigation at source (kg/s)	Mitigation Measure efficiency at Source	Sediment Loss Rate - with mitigation at source (kg/s)	SS at WSR - without mitigation at WSR (mg/L)	Mitigation Measure at WSR	SS at WSR - with mitigation at WSR (mg/L)
Sand blanket laying within Area A / B (Sand fill)	250	1,500 m^3/hr	3.8265	80%	0.7653	17.27	96%	0.69
							Total	**1.34**
Beyond 400 m away from nearest WSRs								
Localized dredging at the northeast seawall	24	600 m^3/day	0.2778	75%	0.0695	16.34	96%	0.65
Sand blanket laying within Area A / B (Sand fill)	400	1,500 m^3/hr	3.8265	80%	0.7653	10.79	96%	0.43
							Total	**1.08**

Table 4.5 Calculation of Cumulative SS Elevation (Dredging Rate at 700m^3/day) – Stage 1, 2 and 3

Sources	Distance from the Nearest WSR (m)	Work Rate	Sediment Loss Rate - without mitigation at source (kg/s)	Mitigation Measure efficiency at Source	Sediment Loss Rate - with mitigation at source (kg/s)	SS at WSR - without mitigation at WSR (mg/L)	Mitigation Measure at WSR	SS at WSR - with mitigation at WSR (mg/L)
Within 250 m away from nearest WSRs								
Localized dredging at the northeast seawall	24	700 m^3/day	0.3241	75%	0.0810	19.04	96%	0.76
Sand blanket laying within Area A / B (Sand fill)	58	850 m^3/hr	2.1684	80%	0.4337	42.19	96%	1.69
							Total	**2.45**
Beyond 250 m away from nearest WSRs								
Localized dredging at the northeast seawall	24	700 m^3/day	0.3241	75%	0.0810	19.04	96%	0.76
Sand blanket laying within Area A / B (Sand fill)	250	1,400 m^3/hr	3.5714	80%	0.7143	16.12	96%	0.64
							Total	**1.40**
Beyond 400 m away from nearest WSRs								
Localized dredging at the northeast seawall	24	700 m^3/day	0.3241	75%	0.0810	19.04	96%	0.76

Sources	Distance from the Nearest WSR (m)	Work Rate	Sediment Loss Rate - without mitigation at source (kg/s)	Mitigation Measure efficiency at Source	Sediment Loss Rate - with mitigation at source (kg/s)	SS at WSR - without mitigation at WSR (mg/L)	Mitigation Measure at WSR	SS at WSR - with mitigation at WSR (mg/L)
Sand blanket laying within Area A / B (Sand fill)	400	1,400 m^3/hr	3.5714	80%	0.7143	10.08	96%	0.40
							Total	**1.16**

Table 4.6 Calculation of SS Elevation – Stage 1, 2 and 3 (Dredging only)

Sources	Distance from the Nearest WSR (m)	Work Rate	Sediment Loss Rate - without mitigation at source (kg/s)	Mitigation Measure efficiency at Source	Sediment Loss Rate - with mitigation at source (kg/s)	SS at WSR - without mitigation at WSR (mg/L)	Mitigation Measure at WSR	SS at WSR - with mitigation at WSR (mg/L)
Beyond 24 m away from nearest WSRs								
Localized dredging at the northeast seawall	24	1,900 m^3/day	0.8796	75%	0.2199	51.69	96%	2.07
							Total	**2.07**

Table 4.7 Calculation of SS Elevation – Stage 1, 2 and 3 (Sand fill only)

Sources	Distance from the Nearest WSR (m)	Work Rate	Sediment Loss Rate - without mitigation at source (kg/s)	Mitigation Measure efficiency at Source	Sediment Loss Rate - with mitigation at source (kg/s)	SS at WSR - without mitigation at WSR (mg/L)	Mitigation Measure at WSR	SS at WSR - with mitigation at WSR (mg/L)
Within 250 m away from nearest WSRs								
Sand blanket laying within Area A / B (Sand fill)	58	1,250 m^3/hr	3.1888	80%	0.6378	62.04	96%	2.48
							Total	**2.48**
Beyond 250 m away from nearest WSRs								
Sand blanket laying within Area A / B (Sand fill)	250	2,150 m^3/hr	5.4847	80%	1.0969	24.75	96%	0.99
							Total	**0.99**
Beyond 400 m away from nearest WSRs								
Sand blanket laying within Area A / B (Sand fill)	400	2,150 m^3/hr	5.4847	80%	1.0969	15.47	96%	0.62
							Total	**0.62**

Stage 4A (Newly added construction sequence)

After substantial completion of seawall (except approximately 50m opening

and approximately 200m silt curtain located at the eastern side of artificial island), marine filling will be carried out within Area B (reclamation area) and precast seawall structure will be installed at Area A (Seawall A and Seawall B) concurrently. Installation of remaining block work seawall at Area A shall also be carried out. In parallel, ground treatment works such as DCM works and laying Grade 200 rock to form rock mould will be carried out at Area B (Breakwater A and B). The duration of this stage is about 2-3 months.

In this stage, concurrent marine works for the Project include (1) marine filling within reclamation area at Area B; (2) installation of precast seawall structure at remaining seawall portion at the eastern side of Artificial Island at Area A (Sewall A and Seawall B); (3) installation of block work seawall at the remaining seawall portion at the eastern side of Artificial Island at Area A; and (4) Ground Treatment such as DCM works and laying Grade 200 rock to form rock mound at Area B (Breakwater A and B). As public fill and sand fill shall both be used for reclamation below +2.5mPD, the maximum filling rate of sand fill and public fill are tabulated in *Tables 4.8 - 4.9* if two filling materials are not filled concurrently.

Marine filling works within reclamation area will only be commenced when the installation of block work seawall near the shoreline have been completed for 310m. In other words, the installation of block work seawall between Vertical Seawall Chainage S_CH0 and Vertical Seawall Chainage S_CH310 shall be completed. Precast caissons located at Seawall A between Chainage SB_CH250 and SB_CH580 and located at Seawall B between Chainage Q_CH0 and Q_CH388 shall also be completed. The locations of vertical seawall chainage, Seawall A and Seawall B chainage at Area A are shown in Figure 7.

Grade 75 and Grade 200 rock shall be used for to fill up the caissons. Rock filling inside the caisson will be carried out within 1 to 2 days after placing it into right position. As rock is assumed to have no fine content, no unacceptable water quality impact will be expected. Nevertheless, Type 6 silt curtain, as stated in Silt Curtain Deployment Plan, will be installed around the caisson under filling. It is not anticipated to have potential laden overflow of suspended solids when the caisson is filled up with Grade 75 and Grade 200 rock due to heavy rainfall. According to the design, the top layer of Grade 75 and Grade 200 rock, acts as ballast inside the caisson, will only be filled up to +1.3mPD. However, the top level of the caisson will be +3mPD. Sufficient spaces are available inside caissons to contain rainwater.

As the seawalls had been constructed higher than +2.5mPD, the fine materials are not anticipated to leak through the constructed seawalls. Prior to complete enclosure of the caisson at the eastern side of the artificial island, double layers silt curtain will be erected both at the western side as marine access opening and at eastern side as fixed installation, as a temporary mitigation measures. Different filling rates shall be adopted so as to minimize the effect on the coral colonies next to the shoreline at Shek Kwu Chau.

A scenario is presented if sand fill and public fill are filled concurrently. *Table*

4.10 can present such relationship.

Table 4.8 Calculation of SS Elevation – Stage 4A (Sand fill only)

Sources	Distance from the Nearest WSR (m)	Work Rate	Sediment Loss Rate - without mitigation at source (kg/s)	Mitigation Measure efficiency at Source	Sediment Loss Rate - with mitigation at source (kg/s)	SS at WSR - without mitigation at WSR (mg/L)	Mitigation Measure at WSR	SS at WSR - with mitigation at WSR (mg/L)
Within 250 m away from nearest WSRs								
Marine Fill within Area B (Sand fill)	60	2,850 m^3/hr	3.1745	80%	0.6349	59.70	96%	2.39
							Total	**2.39**
Beyond 250 m away from nearest WSRs								
Marine Fill within Area B (Sand fill)	250	12,000 m^3/hr	13.366	80%	2.6732	60.33	96%	2.41
							Total	**2.41**

Table 4.9 Calculation of SS Elevation – Stage 4A (Public fill only)

Sources	Distance from the Nearest WSR (m)	Work Rate	Sediment Loss Rate - without mitigation at source (kg/s)	Mitigation Measure efficiency at Source	Sediment Loss Rate - with mitigation at source (kg/s)	SS at WSR - without mitigation at WSR (mg/L)	Mitigation Measure at WSR	SS at WSR - with mitigation at WSR (mg/L)
Within 250 m away from nearest WSRs								
Marine Fill within Area B (Public Fill)	60	485 m^3/hr	3.1998	80%	0.6400	60.18	96%	2.41
							Total	**2.41**
Beyond 250 m away from nearest WSRs								
Marine Fill within Area B (Public Fill)	250	2,090 m^3/hr	13.789	80%	2.7578	62.24	96%	2.49
							Total	**2.49**

Table 4.10 Calculation of Cumulative SS Elevation – Stage 4A

Sources	Distance from the Nearest WSR (m)	Work Rate	Sediment Loss Rate - without mitigation at source (kg/s)	Mitigation Measure efficiency at Source	Sediment Loss Rate - with mitigation at source (kg/s)	SS at WSR - without mitigation at WSR (mg/L)	Mitigation Measure at WSR	SS at WSR - with mitigation at WSR (mg/L)
Within 250 m away from nearest WSRs								
Marine Fill within Area B (Sand fill)	60	1,425 m^3/hr	1.5872	80%	0.3174	29.85	96%	1.19
Marine Fill within Area B (Public fill)	60	240 m^3/hr	1.5834	80%	0.3167	29.78	96%	1.19
							Total	**2.38**

Sources	Distance from the Nearest WSR (m)	Work Rate	Sediment Loss Rate - without mitigation at source (kg/s)	Mitigation Measure efficiency at Source	Sediment Loss Rate - with mitigation at source (kg/s)	SS at WSR - without mitigation at WSR (mg/L)	Mitigation Measure at WSR	SS at WSR - with mitigation at WSR (mg/L)
Beyond 250 m away from nearest WSRs								
Marine Fill within Area B (Sand fill)	250	6,000 m^3/hr	6.6831	80%	1.3367	30.17	96%	1.21
Marine Fill within Area B (Public fill)	250	1,045 m^3/hr	6.8943	80%	1.3789	31.12	96%	1.24
							Total	**2.45**

Stage 5

In this stage, concurrent marine works for the Project include (1) marine filling within reclamation at Area B, and (2) installation of precast seawall structure at breakwater. As public fill and sand fill shall both be used for reclamation below +2.5mPD, the maximum filling rate of sand fill and public fill are tabulated in *Tables 4.11 – 4.12* if two filling materials are not filled concurrently.

Grade 75 and Grade 200 rock shall be used for to fill up the caissons. Rock filling inside the caisson will be carried out within 1 to 2 days after placing it into right position. As rock is assumed to have no fine content, no unacceptable water quality impact will be expected. Nevertheless, Type 6 silt curtain, as stated in Silt Curtain Deployment Plan, will be installed around the caisson under filling. It is not anticipated to have potential laden overflow of suspended solids when the caisson is filled up with Grade 75 and Grade 200 rock due to heavy rainfall. According to the design, the top layer of Grade 75 and Grade 200 rock, acts as ballast inside the caisson, will only be filled up to +1.3mPD. However, the top level of the caisson will be +3mPD. Sufficient spaces are available inside caissons to contain rainwater.

As the seawalls had been constructed higher than +2.5mPD, the fine materials are not anticipated to leak through the constructed seawalls. Therefore, the nearest coral colonies being affected by shall be located in the vicinity between the seawall and breakwater. The minimum distance between the marine filling within reclamation at Area B and the nearest coral colonies shall be over 400m after changing the location of marine access.

A scenario is presented if sand fill and public fill are filled concurrently. *Table 4.13* can present such relationship.

Table 4.11 Calculation of SS Elevation – Stage 5 (Sand fill only)

Sources	Distance from the Nearest WSR (m)	Work Rate	Sediment Loss Rate - without mitigation at source (kg/s)	Mitigation Measure efficiency at Source	Sediment Loss Rate - with mitigation at source (kg/s)	SS at WSR - without mitigation at WSR (mg/L)	Mitigation Measure at WSR	SS at WSR - with mitigation at WSR (mg/L)
Beyond 400 m away from nearest WSRs								
Marine Fill within Area B (Sand fill)	400	19,850 m^3/hr	22.11	80%	4.422	62.35	96%	2.49
							Total	**2.49**

Table 4.12 Calculation of SS Elevation – Stage 5 (Public fill only)

Sources	Distance from the Nearest WSR (m)	Work Rate	Sediment Loss Rate - without mitigation at source (kg/s)	Mitigation Measure efficiency at Source	Sediment Loss Rate - with mitigation at source (kg/s)	SS at WSR - without mitigation at WSR (mg/L)	Mitigation Measure at WSR	SS at WSR - with mitigation at WSR (mg/L)
Beyond 400 m away from nearest WSRs								
Marine Fill within Area B (Public Fill)	400	3,350 m^3/hr	22.102	80%	4.4205	62.35	96%	2.49
							Total	**2.49**

Table 4.13 Calculation of Cumulative SS Elevation – Stage 6

Sources	Distance from the Nearest WSR (m)	Work Rate	Sediment Loss Rate - without mitigation at source (kg/s)	Mitigation Measure efficiency at Source	Sediment Loss Rate - with mitigation at source (kg/s)	SS at WSR - without mitigation at WSR (mg/L)	Mitigation Measure at WSR	SS at WSR - with mitigation at WSR (mg/L)
Beyond 400 m away from nearest WSRs								
Marine Fill within Area B (Sand fill)	400	9,925 m^3/hr	11.055	80%	2.211	31.2	96%	1.25
Marine Fill within Area B (Public fill)	400	1,675 m^3/hr	11.051	80%	2.21	31.15	96%	1.25
							Total	**2.50**

Summary of Appropriate Mitigation Measures and Works Rates

A number of mitigation measures have been recommended in the approved EIA Report, FEP and the VEP Supporting Document, including control of dredging rate, use of silt curtain during dredging as well as use of grab dredger or bottom placement method for sand blanket laying. These measures will be properly implemented during the construction and have been taken into account in the assessment. In addition, it is recommended to deploy an additional layer of silt curtain at the sediment source as well as two double

layers of silt curtains between the sediment sources and nearby WSRs to provide additional protection to these WSRs Implementation schedules of the proposed mitigation measures is attached in *Annex B*.

Based on the above assumptions, maximum SS elevation predicted at the nearest WSRs for various stages of the reclamation is expected to be at or below the corresponding SS assessment criterion of 2.5 mg/L with the following work rates for sand blanket laying stated in *Tables 4.14 – 4.24*.

Table 4.14 ***Summary of Maximum Allowable Dredging Rate and Filling Rate (m^3/hr and m^3/day for 12 hr work day) for Sand Blanket Laying while carrying out dredging and filling works concurrently (Constant Dredging rate at 380m^3/day)***

	Stage 1 - 3
Shortest distance to nearest coral (m) – Dredging Rate	24
Distance from Nearest WSR (m) – Dredging Rate	
24 - > 400	380 m^3/day
Shortest distance to nearest coral (m) – Filling Rate	58
Distance from Nearest WSR (m) – Filling Rate	
< 250	1,000 m^3/hr 12,000 m^3/day
250 – 400	1,730 m^3/hr 20,760 m^3/day
> 400	1,730 m^3/hr 20,760 m^3/day

Table 4.15 ***Summary of Maximum Allowable Dredging Rate and Filling Rate (m^3/hr and m^3/day for 12 hr work day) for Sand Blanket Laying while carrying out dredging and filling works concurrently (Constant Dredging rate at 600m^3/day)***

	Stage 1 - 3
Shortest distance to nearest coral (m) – Dredging Rate	24
Distance from Nearest WSR (m) – Dredging Rate	
24 - > 400	600 m^3/day
Shortest distance to nearest coral (m) – Filling Rate	58
Distance from Nearest WSR (m) – Filling Rate	
< 250	900 m^3/hr 10,800 m^3/day
250 – 400	1,500 m^3/hr 18,000 m^3/day

	Stage 1 - 3
> 400	1,500 m^3/hr 18,000 m^3/day

Table 4.16 ***Summary of Maximum Allowable Dredging Rate and Filling Rate (m^3/hr and m^3/day for 12 hr work day) for Sand Blanket Laying while carrying out dredging and filling works concurrently (Constant Dredging rate at 700m^3/day)***

	Stage 1 - 3
Shortest distance to nearest coral (m) – Dredging Rate	24
Distance from Nearest WSR (m) – Dredging Rate	
24 - > 400	700 m^3/day
Shortest distance to nearest coral (m) – Filling Rate	58
Distance from Nearest WSR (m) – Filling Rate	
< 250	850 m^3/hr 10,200 m^3/day
250 – 400	1,400 m^3/hr 16,800 m^3/day
> 400	1,400 m^3/hr 16,800 m^3/day

Table 4.17 ***Summary of Maximum Dredging Rate (m^3/day for 12 hr work day) for carrying out dredging works only***

	Stage 1 - 3
Shortest distance to nearest coral (m)	24
Distance from Nearest WSR (m)	
24 - > 400	1900 m^3/day

Table 4.18 ***Summary of Maximum Filling Rate (m^3/hr and m^3/day for 12 hr work day) for Sand Blanket Laying while carrying out filling works by using sand fill only***

	Stage 1 - 3
Shortest distance to nearest coral (m)	58
Distance from Nearest WSR (m)	
< 250	1,250 m^3/hr 15,000 m^3/day
250 – 400	2,150 m^3/hr 25,800 m^3/day
> 400	2,150 m^3/hr 25,800 m^3/day

Table 4.19 ***Summary of Maximum Allowable Filling Rate (m^3/hr and m^3/day for 12 hr work day) for Reclamation while filling sand fill and public fill concurrently***

	Stage 4A (Sand fill)	**Stage 4A (Public fill)**
Shortest distance to nearest coral (m)	60	60
Distance from Nearest WSR (m) – Filling Rate		
< 250	1,425 m^3/hr 17,100 m^3/day	240 m^3/hr 2,880 m^3/day
> 250	6,000 m^3/hr 72,000 m^3/day	1,045 m^3/hr 15,540 m^3/day

Table 4.20 ***Summary of Maximum Allowable Filling Rate (m^3/hr and m^3/day for 12 hr work day) for Reclamation while filling sand fill only***

	Stage 4A (Sand fill)
Shortest distance to nearest coral (m)	60
Distance from Nearest WSR (m) – Filling Rate	
< 250	2,850 m^3/hr 34,200 m^3/day
> 250	12,000 m^3/hr 144,000 m^3/day

Table 4.21 ***Summary of Maximum Allowable Filling Rate (m^3/hr and m^3/day for 12 hr work day) for Reclamation while filling public fill only***

	Stage 4A (Public fill)
Shortest distance to nearest coral (m)	60
Distance from Nearest WSR (m) – Filling Rate	
< 250	485 m^3/hr 5,820 m^3/day
> 250	2,090 m^3/hr 25,080 m^3/day

Table 4.22 ***Summary of Maximum Allowable Filling Rate (m^3/hr and m^3/day for 12 hr work day) for Reclamation while filling sand fill and public fill concurrently***

	Stage 5 (Sand fill)	**Stage 5 (Public fill)**
Shortest distance to nearest coral (m)	> 400	> 400
Distance from Nearest WSR (m) – Filling Rate		
>400	9,925 m^3/hr 119,100 m^3/day	1,675 m^3/hr 20,100 m^3/day

Table 4.23 ***Summary of Maximum Allowable Filling Rate (m^3/hr and m^3/day for 12 hr work day) for Reclamation while filling sand fill only***

	Stage 5 (Sand fill)
Shortest distance to nearest coral (m)	> 400
Distance from Nearest WSR (m) – Filling Rate	
> 400	19,850 m^3/hr 238,200 m^3/day

Table 4.24 ***Summary of Maximum Allowable Filling Rate (m^3/hr and m^3/day for 12 hr work day) for Reclamation while filling public fill only***

	Stage 5 (Public fill)
Shortest distance to nearest coral (m)	> 400
Distance from Nearest WSR (m) – Filling Rate	
> 400	3,350 m^3/hr 40,200 m^3/day

Depending on the distance between the work fronts and the coral colonies, different dredging rate and filling rates shall be adopted. For carrying out construction activities in Stages 1 - 3, the allowable dredging and filling rates shall referred to Tables 4.12 – 4.18 and Figure 6A. For carrying out construction activities in Stage 4A, the allowable filling rates shall refer to Tables 4.19 – 4.21 and Figure 6B. For carrying out construction activities in Stage 5, the allowable filling rates shall refer to Tables 4.22 – 4.24 and Figure 6C.

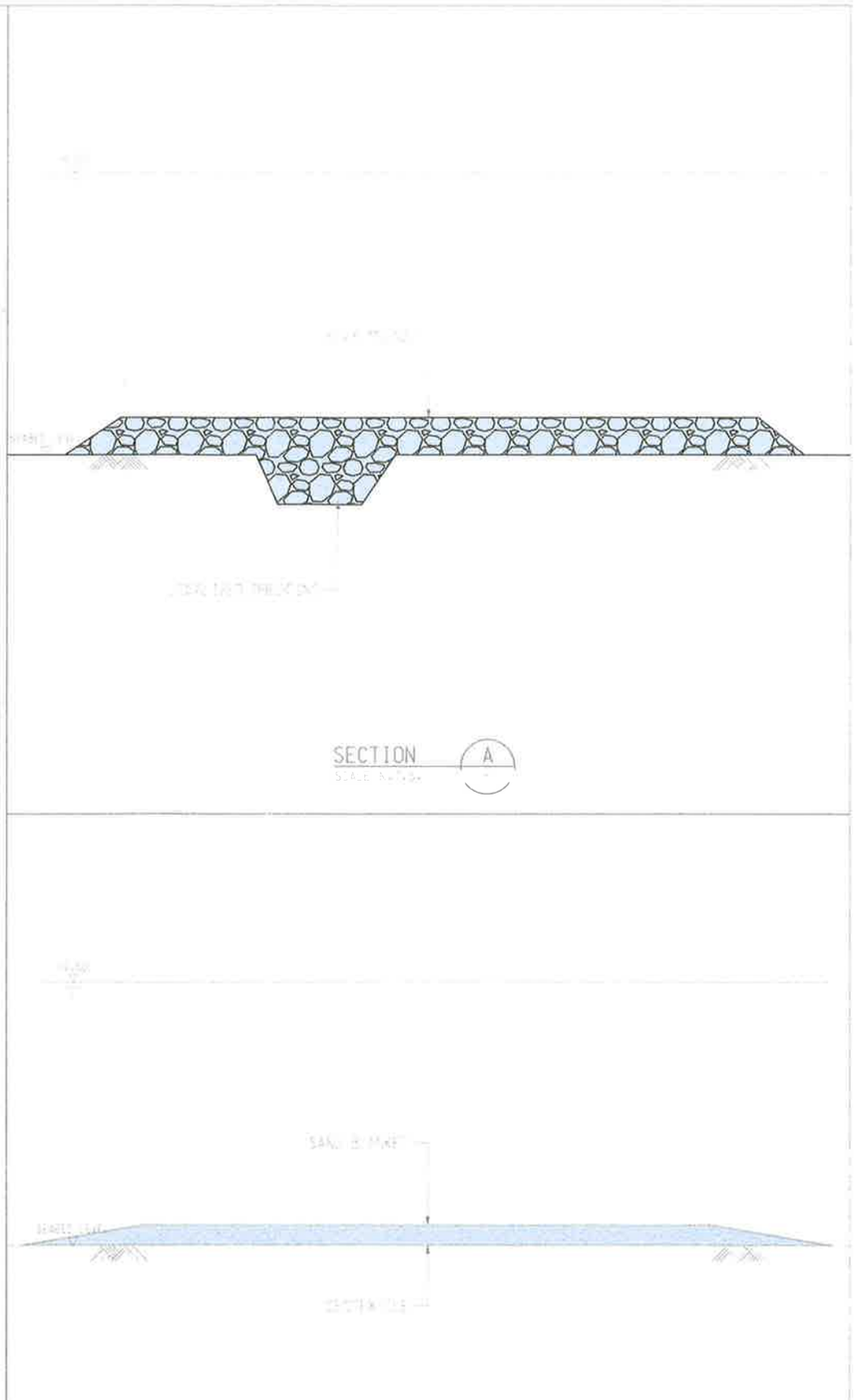
In general, the dredging and filling rates for Stages 1, 2, 3 and 5 are remained the same as the previously approved Supporting Document for Reviewing Dredging Rate and Filling Rate (Rev. C).

Based on the assessment above, no unacceptable water quality impact associated with the proposed changes in construction sequence for Stage 4A for the early start of reclamation works will be expected with the implementation of newly proposed mitigation measures.

Annex A

Updated Sequence of Construction - Stage 1 to Stage 5

SITE LAYOUT PLAN



PROJECT

Contract EP/SP/66/12 Integrated Waste Management Facilities, Phase 1
Proposed Construction Sequence of Seawall, Reclamation and Breakwater, Stage 1

CLIENT

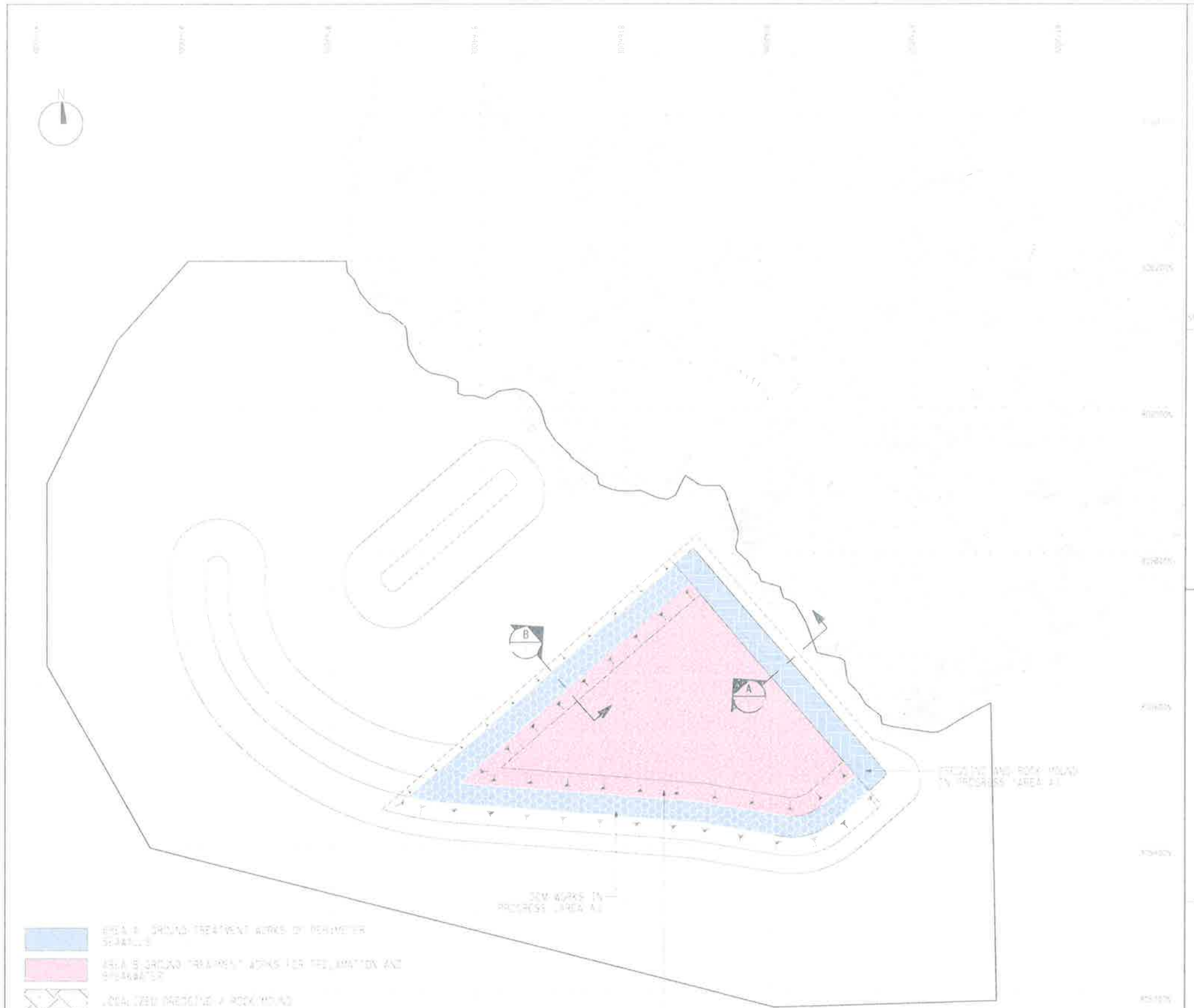
環境保護署
Environmental Protection Department

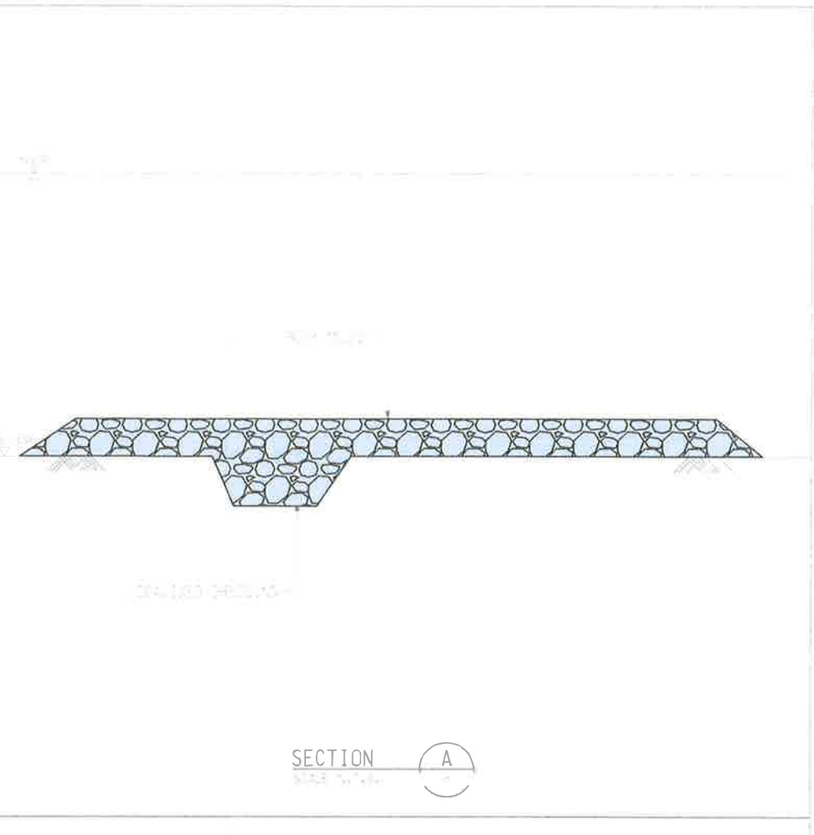
DESIGN CONTRACTOR

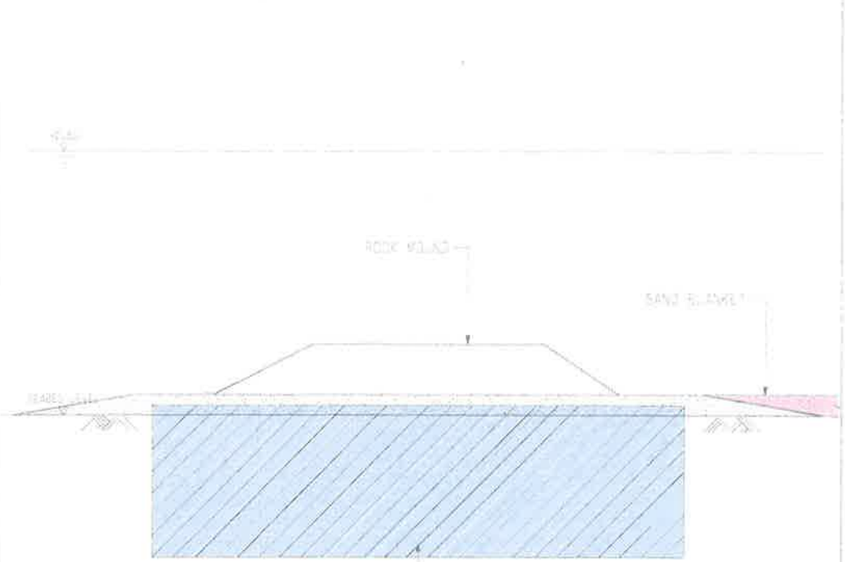
Keppel Seghers
KEPPEL SEGHERS - ZHEN HUA JOINT VENTURE

TITLE

FIGURE 1





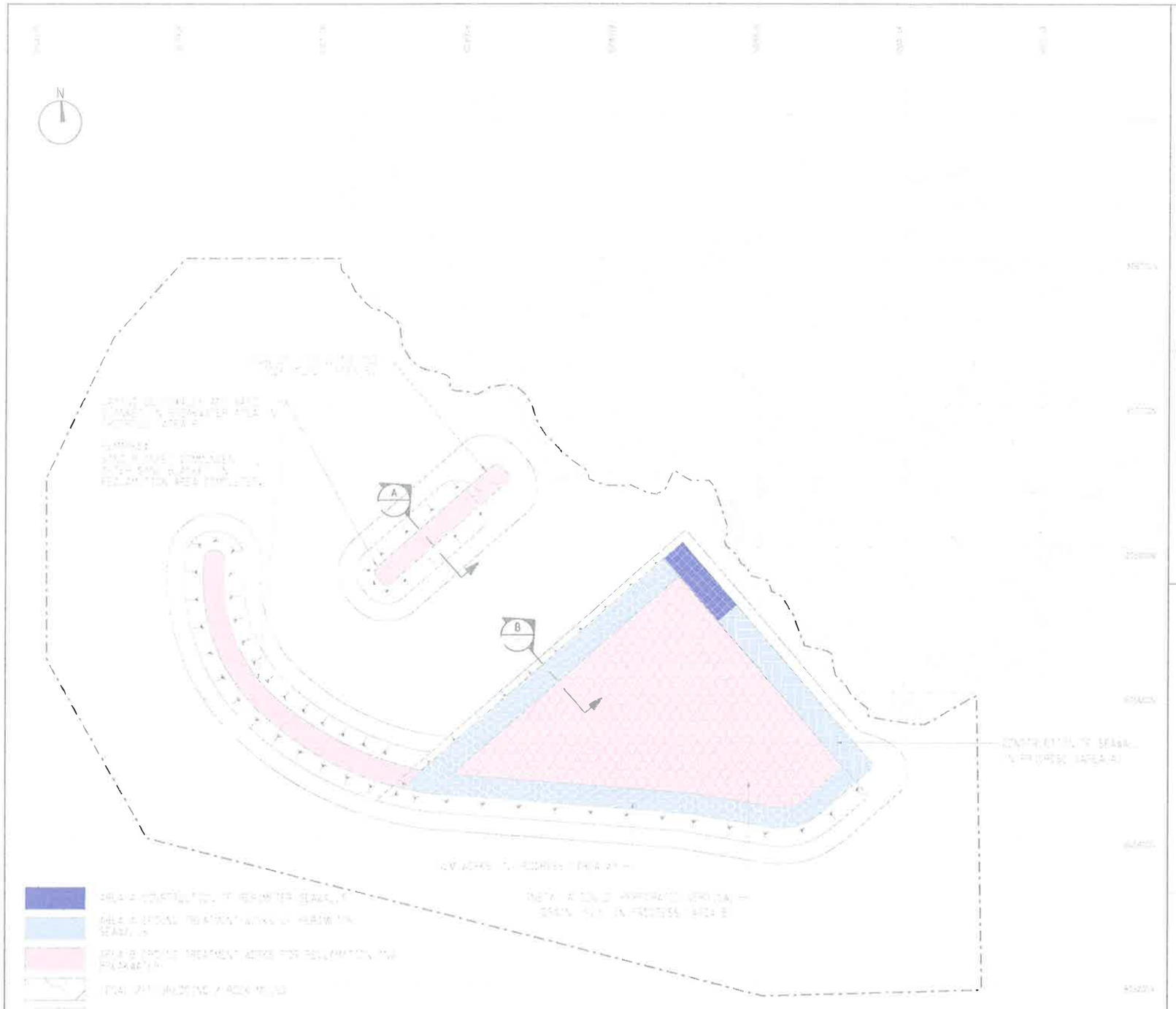


Contract EP/SP/66/12 Integrated Waste Management Facilities, Phase 1
Proposed Construction Sequence of Seawall, Reclamation and Breakwater, Stage 1

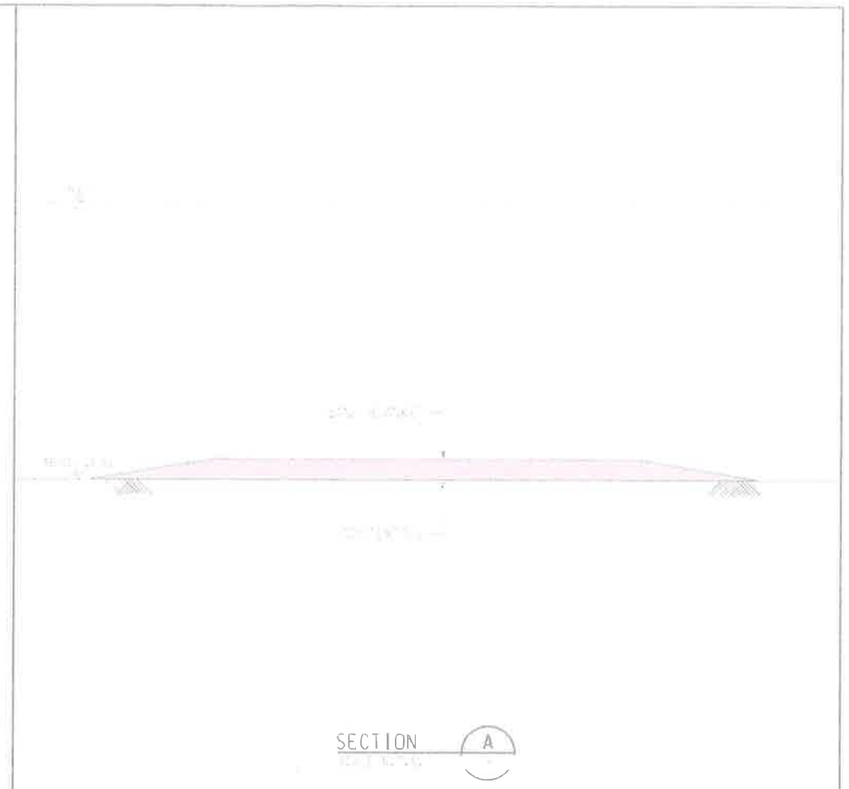
環境保護署
Environmental Protection Department

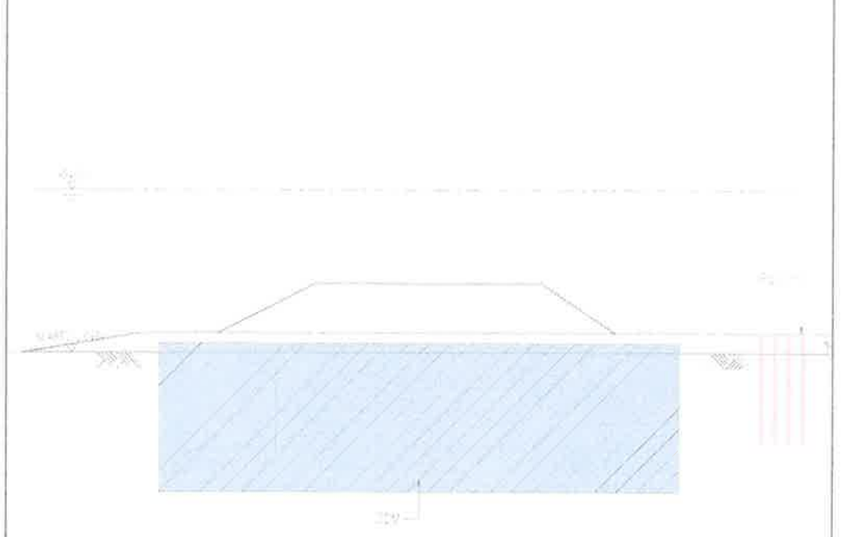
Keppel Seghers
KEPPEL SEGHERS - ZHEN HUA JOINT VENTURE

FIGURE 2



SITE LAYOUT PLAN



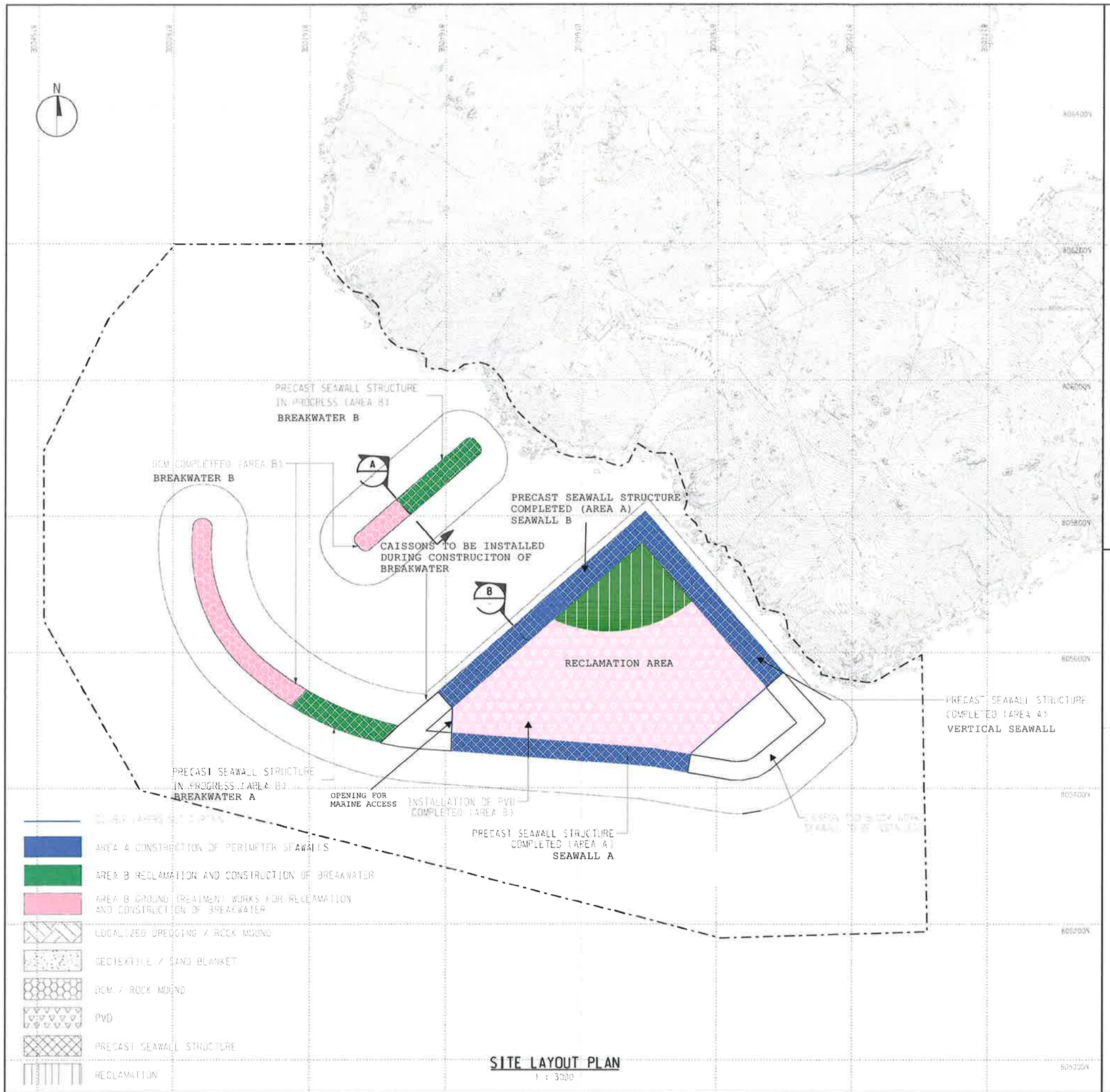


Contract EP/SP/66/12 Integrated Waste Management Facilities, Phase 1
Proposed Construstion Sequence of Seawall, Reclamation and Breakwater, Stage 3

環境保護署
Environmental Protection Department

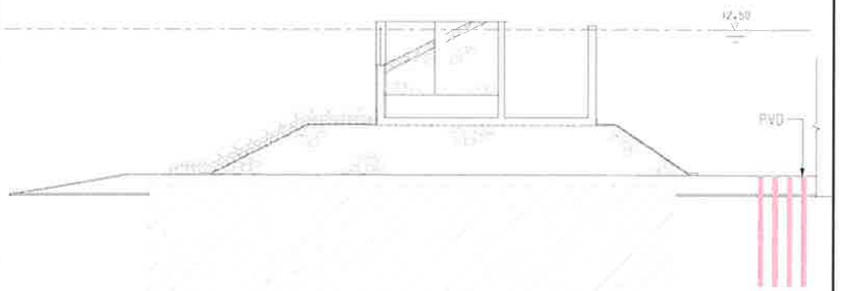
Keppel Seghers – Zhen Hua Joint Venture

FIGURE 3



SITE LAYOUT PLAN
1 : 3000

SECTION A
SCALE N.T.S.



SECTION B
SCALE N.T.S.

Contract EP/SP/66/12 Integrated Waste Management Facilities, Phase 1
Proposed Construstion Sequence of Seawall, Reclamation and Breakwater, Stage 4A

環境保護署
Environmental Protection Department

Keppel Seghers – Zhen Hua Joint Venture

FIGURE 4A

PRECAST SEAWALL STRUCTURE
IN PROGRESS (AREA B)
BREAKWATER B

DCM (COMPLETED) (AREA B)
BREAKWATER B

A

CAISSONS TO BE INSTALLED
DURING CONSTRUCTION OF
BREAKWATER

PRECAST SEAWALL STRUCTURE
COMPLETED (AREA A)
SEAWALL B

B

RECLAMATION AREA

PRECAST SEAWALL STRUCTURE
COMPLETED (AREA A)
VERTICAL SEAWALL

PRECAST SEAWALL STRUCTURE
IN PROGRESS (AREA B)
BREAKWATER A

OPENING FOR
MARINE ACCESS

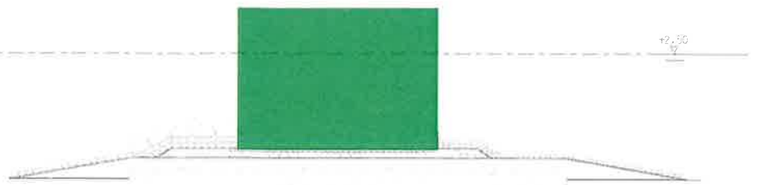
INSTALLATION OF PVD
COMPLETED (AREA B)

PRECAST SEAWALL STRUCTURE
COMPLETED (AREA A)
SEAWALL A

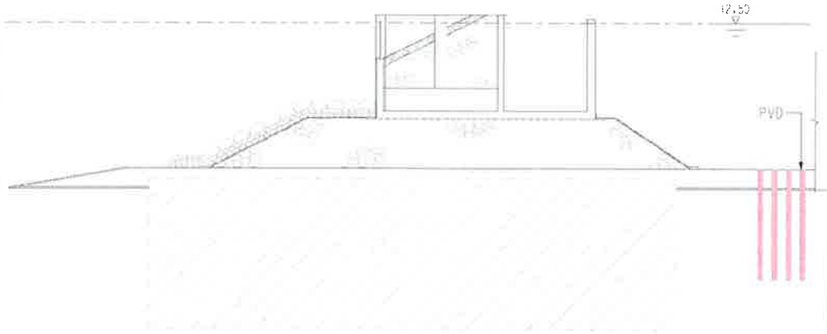
RECLAMATION IN
PROGRESS (AREA B)

AREA A CONSTRUCTION OF PERIMETER SEAWALLS
AREA B RECLAMATION AND CONSTRUCTION OF BREAKWATER
AREA B GROUND TREATMENT WORKS FOR RECLAMATION AND CONSTRUCTION OF BREAKWATER
LOCALIZED DREDGING / ROCK MOUND
GEOTEXTILE / SAND BLANKET
DCM / ROCK MOUND
PVD
PRECAST SEAWALL STRUCTURE
RECLAMATION

SITE LAYOUT PLAN
1 : 3000



SECTION A
SCALE N.T.S.



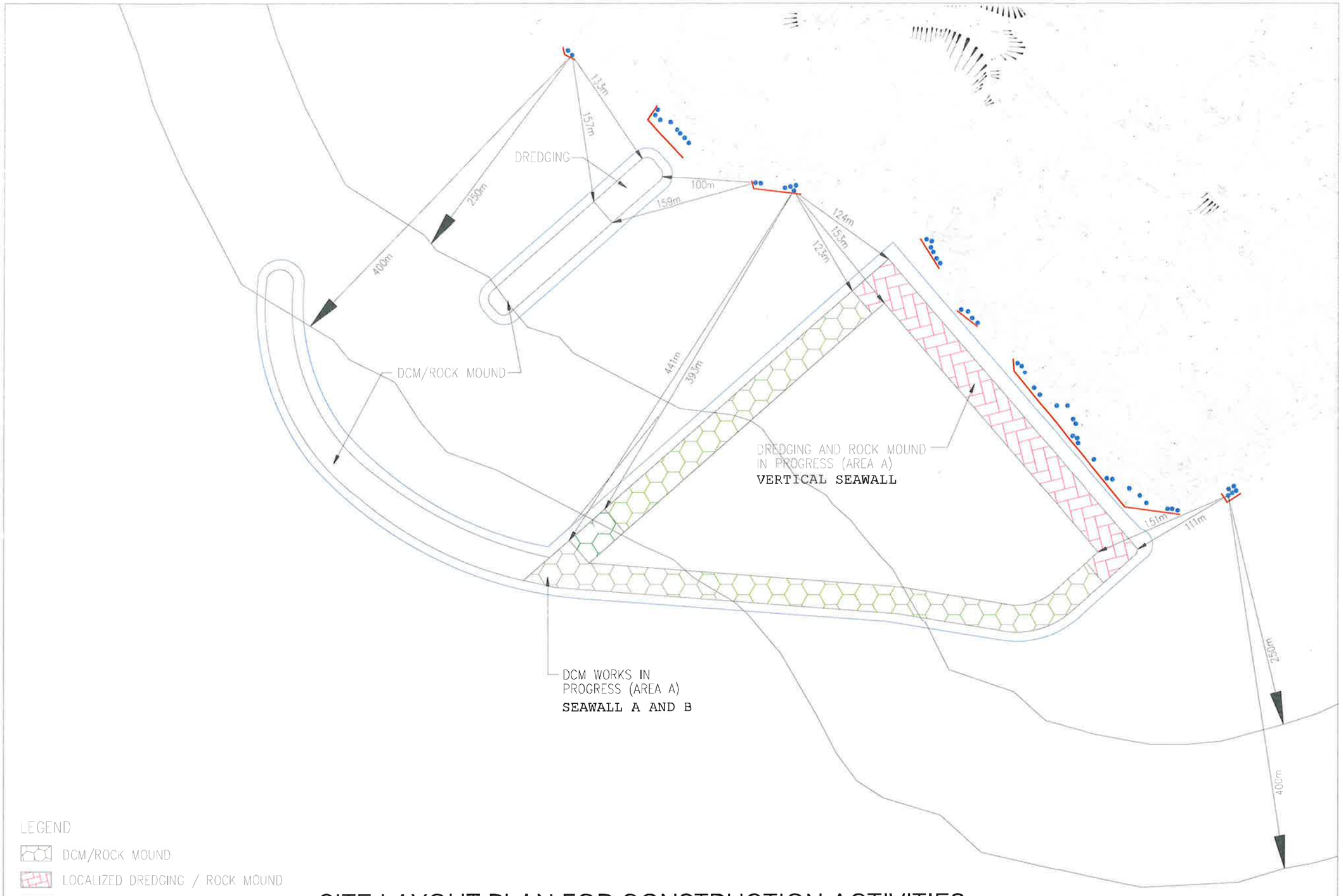
SECTION B
SCALE N.T.S.

PROJECT
Contract EP/SP/66/12 Integrated Waste Management Facilities, Phase 1
Proposed Construstion Sequence of Seawall, Reclamation and Breakwater, Stage 5

CLIENT
環境保護署
Environmental Protection Department

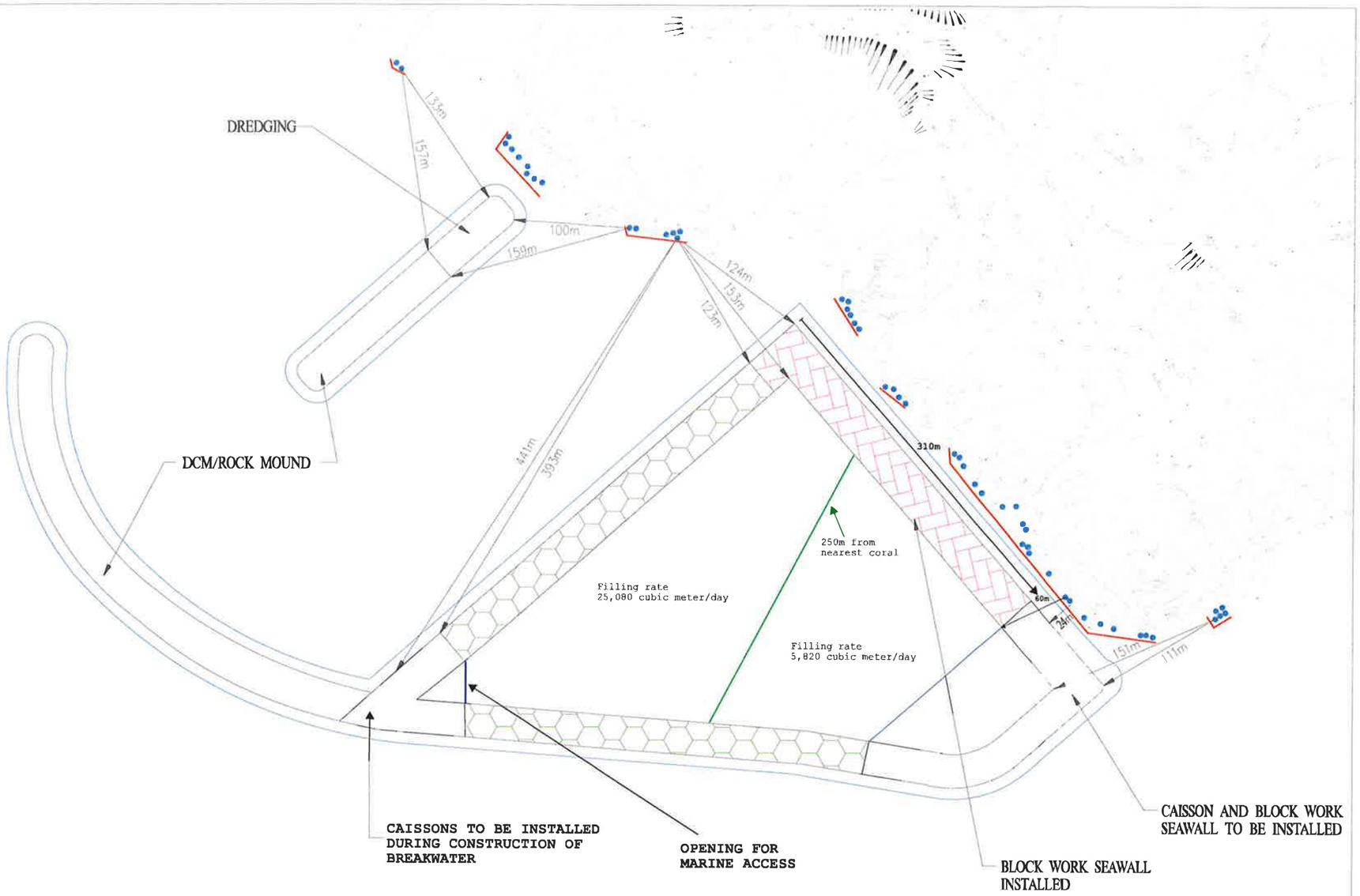
DBO CONTRACTOR
Keppel Seghers
Keppel Seghers – Zhen Hua Joint Venture

TITLE
FIGURE 5



SITE LAYOUT PLAN FOR CONSTRUCTION ACTIVITIES NEAR CORAL COLONIES AT STAGES 1 - 3

FIGURE 6A

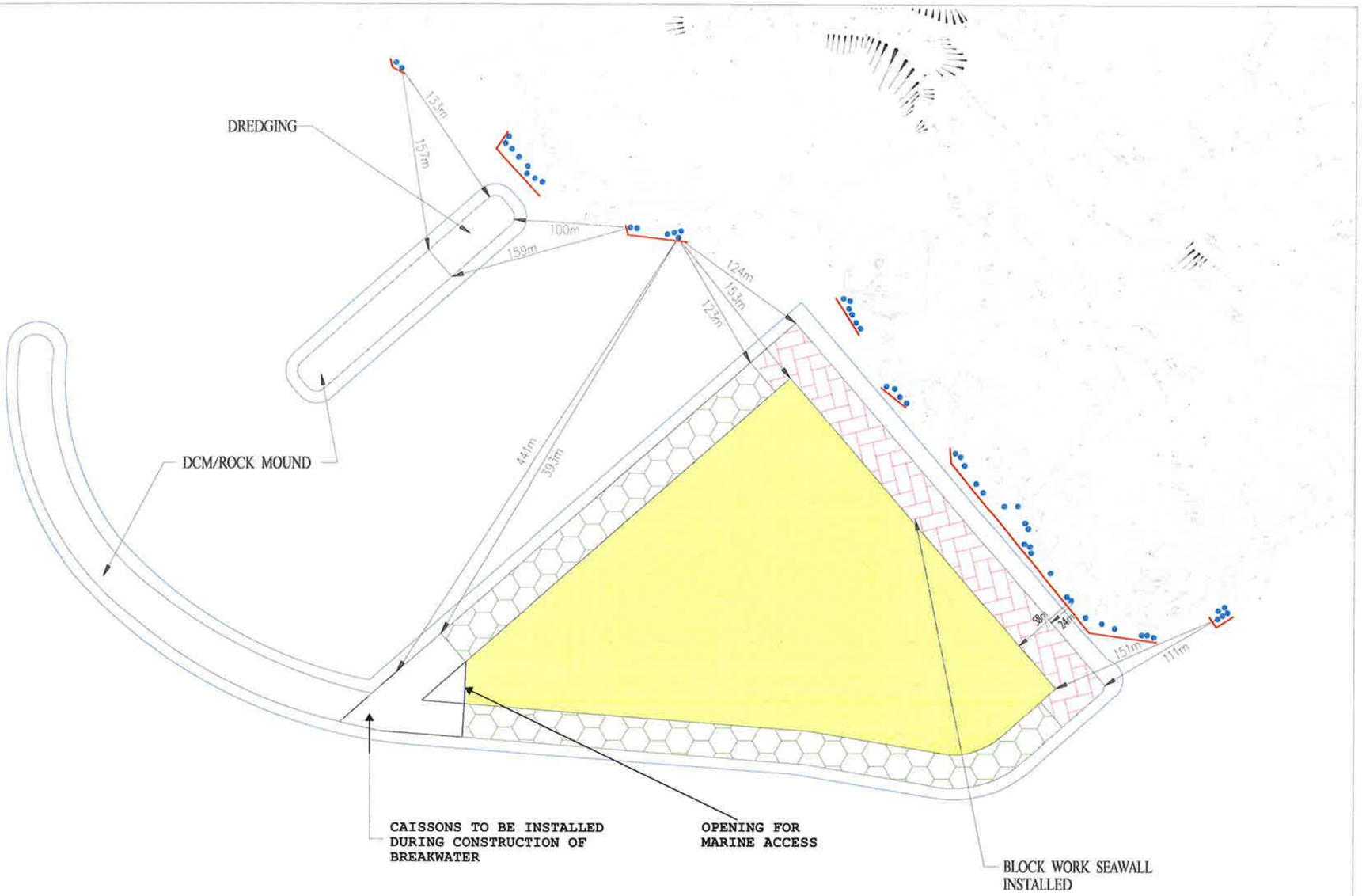


LEGEND

- INSTALLED CAISSONS
- INSTALLED BLOCK WORK SEAWALL
- AREA B RECLAMATION
- TWO DOUBLE LAYERS SILT CURTAIN
- DOUBLE LAYERS SILT CURTAIN
- CORAL COLONIES

SITE LAYOUT PLAN FOR CONSTRUCTION ACTIVITIES NEAR CORAL COLONIES AT STAGE 4A

FIGURE 6B

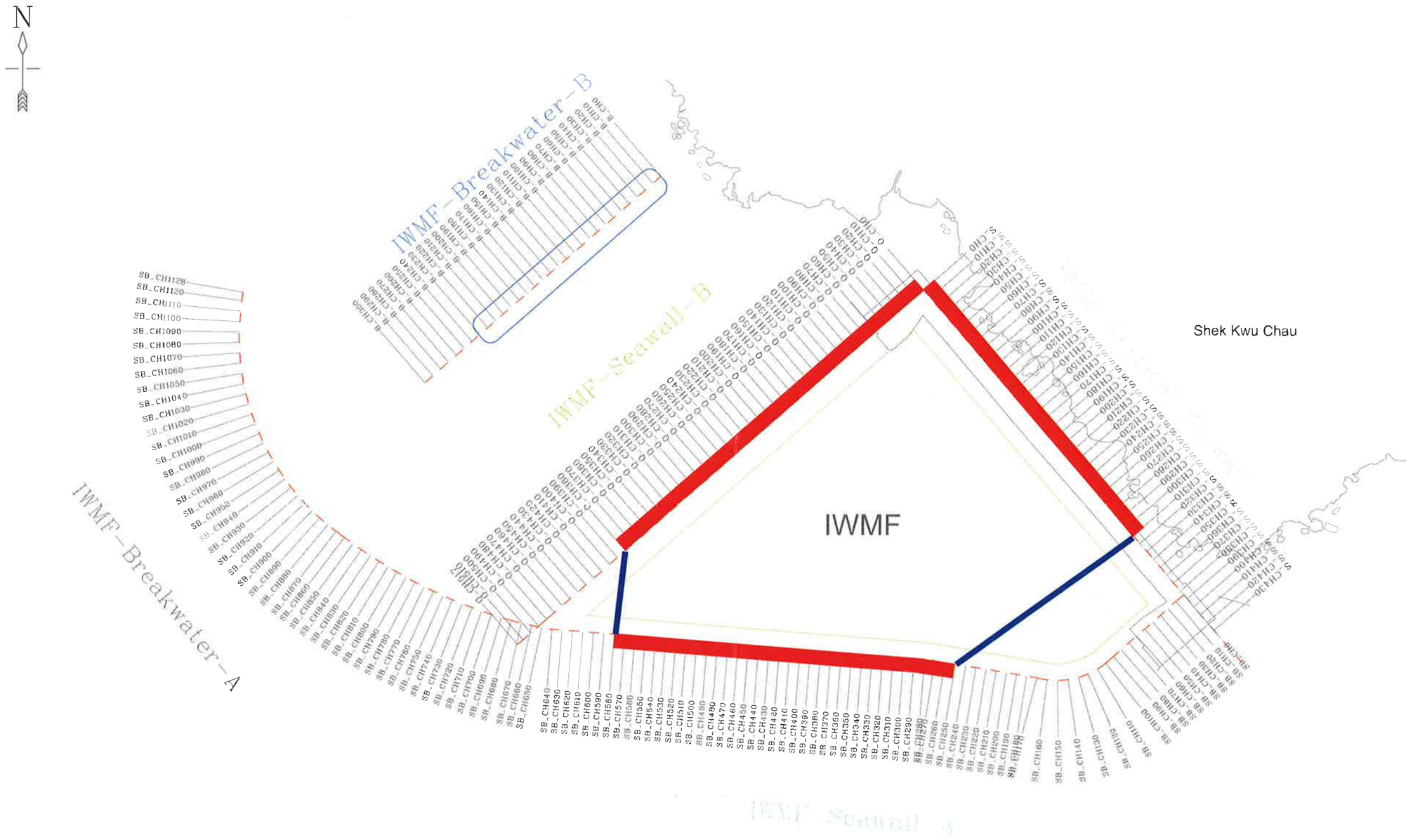


LEGEND

- INSTALLED CAISSONS
- INSTALLED BLOCK WORK SEAWALL
- AREA B RECLAMATION
- TWO DOUBLE LAYERS SILT CURTAIN
- CORAL COLONIES
- DOUBLE

SITE LAYOUT PLAN FOR CONSTRUCTION ACTIVITIES NEAR CORAL COLONIES AT STAGE 5

FIGURE 6C



INSTALLED CAISSONS AND BLOCK WORK SEAWALL

DOUBLE LAYERS SILT CURTAIN

EMPLOYER: 環境保護署 Environmental Protection Department	CONTRACT TITLE: CONTRACT NO. EP/SP/66/12 INTERGRATED WASTE MANAGEMENT FACILITIES PHASE 1	SKETCH TITLE: Layout Plan of IWMF Phase I Seawall Setting Out Alignment	SCALE	1 : 2000 (A1)	CAD REF	DGN	A/C APPR
Supervising Officer: AECOM	MAIN CONTRACTOR: Seghers 吉寶西格斯－振華聯營公司 KEPPEL SEGHERS - ZEEN HUA JOINT VENTURE		ISSUE DATE:	19 Dec 2019	A/C DWG NO	Sheet 1 of 1	
			DRAWN: S.Y LEE	DESIGNED:		DRAWING NO: FIGURE 7	REV: -
			CHECKED: C.W CHUNG	APPROVED:			

Annex B

Implementation Schedule

Implementation Schedule for Dredging works and Filling works

Stages 1 – 3

Supporting Document for Application of VEP Ref. No. / EIA Ref / Other reference	Current Plan Ref. No.	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages			
					Des	C	O	Dec
EP Conditions 2.18-2.20 Approved EIA Section 5b.7.3.26-29 *VEP Supporting Document* Section 2.2.3.12-15.	Table 4.1	• No dredging shall be carried out within 16m to the nearest non-translocatable coral colony/ colonies. • For area between 16m and 50m away from the nearest non-translocatable coral community, the maximum daily dredging rate shall not exceed 60 m^3; for area between 50m and 100m away from the nearest non-translocatable coral community, the maximum daily dredging rate shall not exceed 190 m^3; and for area more than 100m away from the nearest non-translocatable coral community, the maximum daily dredging rate shall not exceed 380 m^3. Written approval of the Director shall be obtained prior to any change of the dredging rates. • Each grab shall be enclosed by a frame-type silt curtain.	IWMF Site	KSZHJV		√		
EP Conditions 2.12	Table 4.1	• Translocation of coral colonies which are very close to the Project site / directly impacted.	IWMF Site	KSZHJV		√		

Supporting Document for Application of VEP Ref. No. / EIA Ref / Other reference	Current Plan Ref. No.	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages			
					Des	C	O	Dec
Approved EIA Section 5b.8.1.9. Coral Translocation Plan								
VEP Supporting Document Section 3.2.2.5-7.	Table 4.1	• The sand blanket laying work will be undertaken using the controlled method such as grab dredger or bottom placement method by trailer suction hopper dredger, sand spreading pontoon or sprinkler barges, etc.) to discharge the sand material near the seabed. • In addition, silt curtains will be deployed to enclose the sand blanket laying area.	IWMF	KSZHJV		√		
Pilot test report under Expansion of Hong Kong International	Table 4.1	• Two double layers of silt curtain will be installed in between Project site and the nearby coral colonies.	IWMF	KSZHJV		√		

Supporting Document for Application of VEP Ref. No. / EIA Ref / Other reference	Current Plan Ref. No.	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages			
					Des	C	O	Dec
Airport into a Three-Runway System Project								
Approved EIAs of Expansion of Hong Kong International Airport into a Three-Runway System and Hong Kong Boundary Crossing Facilities	Table 4.1	• Finish the part of seawall close to coral colonies first to allow the seawall structure to protect coral from suspended solids.	IWMF	KSZHJV		√		
	Table 4.1	• Conduct sand blanket laying at far corner from the nearest coral first while localized dredging proceed close to the nearest coral.	IWMF	KSZHJV		√		

Supporting Document for Application of VEP Ref. No. / EIA Ref / Other reference	Current Plan Ref. No.	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages			
					Des	C	O	Dec
Supporting Document for reviewing dredging rate and filling rate	Table 4.14	• Maximum Allowable Dredging Rate and Filling Rate (m^3/hr and m^3/day for 12 hr work day) for Sand Blanket Laying while carrying out dredging and filling works concurrently (Constant Dredging rate at 380m^3/day).	IWMF	KSZHJV		√		
Supporting Document for reviewing dredging rate and filling rate	Table 4.15	• Maximum Allowable Dredging Rate and Filling Rate (m^3/hr and m^3/day for 12 hr work day) for Sand Blanket Laying while carrying out dredging and filling works concurrently (Constant Dredging rate at 600m^3/day).	IWMF	KSZHJV		√		
Supporting Document for reviewing dredging rate and filling rate	Table 4.16	• Maximum Allowable Dredging Rate and Filling Rate (m^3/hr and m^3/day for 12 hr work day) for Sand Blanket Laying while carrying out dredging and filling works concurrently (Constant Dredging rate at 700m^3/day).	IWMF	KSZHJV		√		
Supporting Document for	Table 4.17	• Maximum Dredging Rate (m^3/day for 12 hr work day) for carrying out dredging works only.	IWMF	KSZHJV		√		

Supporting Document for Application of VEP Ref. No. / EIA Ref / Other reference	Current Plan Ref. No.	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages			
					Des	C	O	Dec
reviewing dredging rate and filling rate								
Supporting Document for reviewing dredging rate and filling rate	Table 4.18	• Maximum Filling Rate (m^3/hr and m^3/day for 12 hr work day) for Sand Blanket Laying while carrying out filling works by using sand fill only.	IWMF	KSZHJV		V		

Note: * - Des – Design; C – Construction; O – Operation; Dec - Decommissioning

Stage 4A

Supporting Document for Application of VEP Ref. No. / EIA Ref / Other reference	Current Plan Ref. No.	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages			
					Des	C	O	Dec
Pilot test report under Expansion of Hong Kong International Airport into a Three-Runway System Project	Table 4.1	• Two double layers of silt curtain will be installed in between Project site and the nearby coral colonies.	IWMF	KSZHJV		√		
Approved EIAs of Expansion of Hong Kong International Airport into a Three-Runway System and	Table 4.1	• Finish the part of seawall close to coral colonies first to allow the seawall structure to protect coral from suspended solids.	IWMF	KSZHJV		√		

Supporting Document for Application of VEP Ref. No. / EIA Ref / Other reference	Current Plan Ref. No.	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages			
					Des	C	O	Dec
Hong Kong Boundary Crossing Facilities								
Silt Curtain Deployment Plan	Table 4.1	• Install Type 6 silt curtain as per approved Silt Curtain Deployment Plan during infilling of Grade 200 and Grade 75 rock into caisson	IWMF	KSZHJV		√		
	Table 4.1	• Install a double layers silt curtain at the eastern side of the artificial island.	IWMF	KSZHJV		√		
Supporting Document for reviewing dredging rate and filling rate	Table 4.19	• Maximum Allowable Filling Rate (m^3/hr and m^3/day for 12 hr work day) for Reclamation while filling sand fill and public fill concurrently	IWMF	KSZHJV		√		
Supporting Document for reviewing dredging rate	Table 4.20	• Maximum Allowable Filling Rate (m^3/hr and m^3/day for 12 hr work day) for Reclamation while filling sand fill only	IWMF	KSZHJV		√		

Supporting Document for Application of VEP Ref. No. / EIA Ref / Other reference	Current Plan Ref. No.	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages			
					Des	C	O	Dec
and filling rate								
Supporting Document for reviewing dredging rate and filling rate	Table 4.21	• Maximum Allowable Filling Rate (m^3/hr and m^3/day for 12 hr work day) for Reclamation while filling public fill only	IWMF	KSZHJV		√		

Note: * - Des – Design; C – Construction; O – Operation; Dec - Decommissioning

Stage 5

Supporting Document for Application of VEP Ref. No. / EIA Ref / Other reference	Current Plan Ref. No.	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages			
					Des	C	O	Dec
Pilot test report under Expansion of Hong Kong International Airport into a Three-Runway System Project	Table 4.1	• Two double layers of silt curtain will be installed in between Project site and the nearby coral colonies.	IWMF	KSZHJV		√		
Silt Curtain Deployment Plan	Table 4.1	• Install Type 6 silt curtain as per approved Silt Curtain Deployment Plan during infilling of Grade 200 and Grade 75 rock into caisson.	IWMF	KSZHJV		√		
Supporting Document for reviewing dredging rate and filling rate	Table 4.22	• Maximum Allowable Filling Rate (m^3/hr and m^3/day for 12 hr work day) for Reclamation while filling sand fill and public fill concurrently.	IWMF	KSZHJV		√		

Supporting Document for Application of VEP Ref. No. / EIA Ref / Other reference	Current Plan Ref. No.	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages			
					Des	C	O	Dec
Supporting Document for reviewing dredging rate and filling rate	Table 4.23	• Maximum Allowable Filling Rate (m^3/hr and m^3/day for 12 hr work day) for Reclamation while filling sand fill only.	IWMF	KSZHJV		√		
Supporting Document for reviewing dredging rate and filling rate	Table 4.24	• Maximum Allowable Filling Rate (m^3/hr and m^3/day for 12 hr work day) for Reclamation while filling public fill only.	IWMF	KSZHJV		√		

Note: * - Des – Design; C – Construction; O – Operation; Dec - Decommissioning

After completion of all reclamation works and breakwater construction

Supporting Document for Application of VEP Ref. No. / EIA Ref / Other reference	Current Plan Ref. No.	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages			
					Des	C	O	Dec
	Table 4.1	• Conduct one post construction monitoring survey for the mapped coral colonies.	IWMF	KSZHJV		√		

Note: * - Des – Design; C – Construction; O – Operation; Dec - Decommissioning